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ABSTRACT

The Roanoke Area 2+2 Project in Automated Manufacturing Technology was undertaken as a cooperative effort of area industries, government, and education to meet the needs of area industries. The program includes 2 years of technical training in high school combined with strong academic preparation and continues with 2 years of advanced technical training at the community college level. The curriculum was written by a curriculum team including representatives of all six participating school systems and Virginia Western Community College; industry representatives participated in Developing a Curriculum (DACUM) workshops to identify the duties and tasks necessary in the field of automated manufacturing. The project featured a strong public relations component because of the need to attract able students. The project was evaluated by Virginia Tech through survey forms, questionnaires, and rating sheets. Response to the project was positive and it has received several awards. The project is continuing student recruitment and expanding into other areas of automated manufacturing. (Following the first section, which is a short final report, most of this document is made up of project documents organized in six sections: project overview in the form of transparencies or handouts, DACUM/industry involvement; curriculum development, including tasks and competencies; public relations; awards and recognition; a 79-page evaluation; and five references. (KC)

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VOCATIONAL EDUCATION PROJECT FINAL REPORT

Project No.: VA-89-PI-IIB3-001
P.L. 98-524, Carl D. Perkins
Vocational Education Act

Title of Project: Roanoke Area 2+2 Program in Automated Manufacturing Technology

Agency/Institution: Roanoke County Schools in cooperation with:
Botetourt County Schools
Craig County Schools
Franklin County Schools
Roanoke City Schools
Salem City Schools
Virginia Western Community College

Project Director: Ben Helmandollar
Wayne Michie, Co-Director

This report covers the period from November 15, 1988, to November 15, 1990.

Date Submitted: November 15, 1990

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Office of Educational Research and Improvement
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ROANOKE AREA 2+2 PROGRAM IN AUTOMATED MANUFACTURING TECHNOLOGY

Statement of Needs and Objectives

Industries in the Roanoke and surrounding area are becoming more and more automated. According to industry representatives, the need for highly skilled technicians who have strong academic preparation in communication, math, science, and computers as well as technical skills training on sophisticated computer-operated machines is becoming more critical in our area. Employers are concerned that the workforce may not be ready to meet the demand for automated manufacturing technicians in the 90's and beyond. Furthermore, the area school systems do not have a curriculum in place that will train students on these new technologies. It was reasoned that a four-year program consisting of two years at the high school level and two years at the community college level would be needed to provide adequate training for this high technology area. In addition, it was determined that the cooperation of industry was needed so that the curriculum developed to train these technicians would indeed meet the needs of area industries.

Objectives for the program include:

1. To develop a curriculum that will combine advanced technical training with strong academic preparation to produce a coordinated high school and community college four-year associates degree program in Automated Manufacturing Technology.
2. To develop partnerships and to open communication and articulation links among area secondary schools, business, industry, the community college, and government.

3. To develop a needs assessment procedure to determine the needs and requirements of area industry in the field of automated manufacturing technology so that a curriculum can be tailored to produce marketable outcomes.
4. To develop evaluation strategies, procedures, and instruments to assess the strengths and weaknesses of the model and to assess outcomes.
5. To provide information to the public about the program.

Description of the Project (Activities and Results)

The Roanoke Area 2+2 Project in Automated Manufacturing Technology was undertaken as a cooperative effort of area industries, government, and education to meet the needs of area industries. The educational agencies involved in the program include the school systems of Roanoke County, Roanoke City, Botetourt County, Salem City, Craig County, Franklin County, and Virginia Western Community College. The program begins with two years of technical training in high school combined with strong academic preparation and continues with two years of advanced technical training at the community college level.

The project began with a kickoff dinner/informational meeting of C.E.O. level representatives from 42 manufacturing firms in the area, government officials, and school boards from all participating divisions, college representatives from area institutions, and educators (see report to business video). At this meeting, commitments to the project were verified and the Public Relations and D.A.C.U.M. committees were initiated (see appendix).

The curriculum writing team began their work with a three-day summer inservice in 1989 for the twenty-seven member team. The curriculum writing

team, charged with the task of developing the curriculum, included outstanding representatives from all six participating school systems and Virginia Western Community College. Areas of expertise included English, computer science, physics, guidance, mathematics, applied physics, machine shop, drafting, technology education, electronics, and administration. The inservice featured State Department presenters (see Appendix for agenda), tours of automated manufacturing facilities (Gardner-Denver Mining and Construction Division and General Electric), and curriculum writing workshop sessions.

To insure that the curriculum being developed would truly train students for the area's workforce, industry representatives were brought in for two DACUM (developing a curriculum) procedures to identify the duties and tasks necessary in the field of automated manufacturing. The first DACUM in May 1989 lasted two full days and was held before curriculum work began. The second was held in March 1990 to validate the curriculum team's work. Fibercom, Graham-White, ITT, Bentech, Ingersoll-Rand, Medeco Security Locks, Singer Furniture, Gardner-Denver Mining and Construction Division, Salem Specialties, Gala Industries, Roanoke Electric Steel, General Electric, and the Virginia Department of Labor all sent representatives to identify the duty and task areas for which the competency-based curriculum was built. Some of the major duty areas identified by industry included supervisory and leadership skills, employability skills, work attitudes and ethics, problem-solving and decision-making skills, machine skills, CAD, CAM, CNC machining skills, trigonometry, and drafting. (See Appendix)

The curriculum writing team gathered existing resource materials from sources nationwide and developed new curriculum materials. Because of the innovative nature of the technology involved, the team's early challenge was to pull together hard-to-find resource materials from varied sources into a four-year coordinated program of study that effectively integrated strong academic preparation with technical skills training. The team's approach included computer searches, site visitations to training centers and industries (including Gardner-Denver Mining and Construction Division), and extensive resource materials

searches including literature, software, hardware, methodologies, strategies, and techniques. The result is a competency-based, criterion-referenced curriculum with enabling objectives, reference sources, and teaching objectives. (See Appendix)

To insure a coordinated transition for the student from the six feeder school systems to the community college level, curriculum developers met in articulation sessions to develop a truly integrated four-year progression that builds on prior knowledge and establishes a clearly defined baseline of knowledge at the transition points. Various entry and exit levels for the students were built into the program so that entry and exit to and from the workforce could be accommodated. Additionally, students can go on to further training to pursue a bachelors degree (2+2+2).

Graduates from the program should be problem-solving, set up, and maintenance technicians that are trained for, and capable of being retrained on, rapidly advancing computer operated equipment in the automated manufacturing industry. The program will expose students to the basic academic, skill, and affective domain areas that will enable them to flourish in this area's burgeoning industrialized manufacturing environment. The four-year coordinated degree program is like no other certification in the valley.

The project featured a strong public relations component because of the need for attracting students to the vocational areas that are capable of coping in a sophisticated manufacturing environment. A public relations committee made up of representatives from the school systems, Salem Times Register, The Office of Economic Development, WSLS-TV, Graphic Productions, Owens and Company Realty, Gardner-Denver Mining and Construction Division, Madison and Associates Marketing, and Credit Marketing Associates was formed. The committee developed and implemented the marketing strategy for the project including targeted campaigns for student, parent, business, and general populations.

As part of their effort, a thirty-second public service announcement featuring Cooper spokesman Kenneth Stevenson, President of Gardner-Denver Mining and Construction Division, was produced and aired locally to inform the public of the 2+2 project and the need for qualified technicians in the valley. The project was featured on nine television news spots and in newspapers and journals. A ten-minute report to business video was produced and shown to guidance counselors, the Chamber of Commerce, advisory committees, and others. A trade show exhibit and brochure were also developed and are being employed to recruit qualified applicants for the program. (See Appendix for video, public service announcement, news releases, brochures, etc.)

Evaluation of the Project

The evaluation of the project was contracted through Virginia Tech's Division of Educational Research and Evaluation. The component includes an evaluation strategy for all deliverables including curriculum design strategies and materials, articulation procedures, curriculum guides, marketing efforts, and student success. Evaluation has included survey forms, questionnaires, and rating sheets. Student and public support for the program has been very positive. (See Appendix)

The program received the following awards:

1. Cooper Industries National Project P.A.C.E. Award $10,000 annually for three years
2. Virginia Tech's Excellence in Education Award
3. Virginia Council on Vocational Education Business Partnership Regional Award
4. U. S. Department of Education Secretary's Award for Outstanding Vocational-Technical Education Programs - state nominee
5. Logo adopted for state-wide 2+2 use
6. Declaration of Excellence by Roanoke County Board of Supervisors

Conclusions, Implications, and Recommendations

Because the project was for curriculum development, students are just now being recruited for entry into the program. Although no student data is available, the benefits derived from the cooperative effort are already evident. The cooperation has led to better communication among area school systems and industry. The public relations effort has created much excitement about enhanced vocational program offerings across the entire Roanoke valley and beyond. The cooperation of industry and education has resulted in a curriculum that is truly industry driven. Hopefully, training at the high school vocational level will better supply the work place as a result of the unique curriculum development process that was undertaken in this project. Furthermore, through the active recruitment and public awareness effort, students who would have normally gone on to college in other degree programs may consider a career in manufacturing as a promising alternative. Both industry and education are benefiting from this exciting partnership.

Our challenge has just begun. Future plans for the project are to continue active student recruitment to ensure that qualified applicants enter the program and to expand curriculum development into other areas of automated manufacturing.

PROJECT ABSTRACT Roanoke Area 2 + 2

TITLE OF PROJECT: Roanoke Area 2 + 2 Program in Automated Manufacturing Technology

PROJECT DIRECTOR: Ben Helmandollar, Assistant Principal A.R.B.T.C.
CO-DIRECTOR: Wayne Michie, Chairman, Engineering/Industrial Technologies Division, V.W.C.C.

INSTITUTIONS: Roanoke County, Salem City, Craig County, Roanoke City, Franklin County and Botetourt County Schools, and Virginia Western Community College

OBJECTIVES OF THE PROJECT:

General objective

To plan, develop, implement, and evaluate a 2 + 2 program in Automated Manufacturing Technology encompassing Virginia Western Community College, Roanoke County Schools, Roanoke City Schools, Botetourt County Schools, Craig County Schools, Franklin County Schools, and Salem City Schools in an articulation effort with area business and industry.

Specific Objectives

1. To open the communication and articulation link between area secondary vocational schools, the community college and the business/industrial community and, further, to develop partnerships with area LEA's, business, industry, community college and government.

2. To select and implement a needs assessment procedure to assess the needs of area industry so that a curriculum can be tailored to produce marketable outcomes.

3. To develop a curriculum framework and curriculum materials necessary for the program.

4. To adopt procedures for program implementation.

5. To develop evaluation strategies, procedures and instruments to assess the strengths and improve the weaknesses of the model.

6. To identify inservice training needs of teachers and provide training resources.

7. To prepare audiovisual materials for the orientation of educators, students, parents, business/industry/government and the community.

8. To provide information to other localities planning or adopting 2 + 2 programs.

9. To provide information to the public about the program.

PROCEDURES OF IMPLEMENTATION:

NEEDS ASSESSMENT AND OCCUPATIONAL RESEARCH Conduct needs assessment and curriculum development research through the joint effort of the L.E.A.'s, the community college, local business and industry and the Department of Educational Research and Evaluation at Virginia Tech.

CURRICULUM DEVELOPMENT Develop a 2 + 2 curriculum to prepare automated manufacturing technicians based on the needs assessment survey and the existing resources of the L.E.A.'s and the community college.

AUDIOVISUAL MATERIALS AND PRESENTATIONS Develop two (2) videotape productions, a student recruitment brochure and presentation materials. Present the program to school, community and industry.

EVALUATION Evaluate deliverables and process. Develop evaluation instruments and procedures for implemented program.

CONTRIBUTIONS TO VOCATIONAL EDUCATION

Rapidly advancing computer assisted drafting and computer assisted machinery have created a need for computer literate, trained machinists capable of adapting to the ever-changing technology in both the machining domain and in computer hardware and software. Students leaving the educational setting equipped with knowledge and skills in working with computer assisted design and computer assisted machinery epitomize the cutting edge of what up-to-date, skilled technicians are expected to be capable of in order to parallel the state of the art in the tools of the trade. To masterfully operate within the complexities of this domain, students must be equipped with a broad base of technical skills, math skills and computer skills as well as instruction in the principles that govern technology. This base will ensure flexibility and adaptability to the ever-changing world of technology, thereby ensuring that the automated manufacturing technician will be an ever-progressing contributor to the technological workforce. This program will effectively prepare students to attack this complex mixture of adaptability, knowledge, skills and problem solving strategies, through a well conceived, co-ordinated curriculum developed with the cooperation of six secondary school systems encompassing 31 secondary and middle schools, the community college and area business and industry.

2 + 2

PROGRAM

OVERVIEW

A+ FOR THE VALLEY

CHARACTERISTICS OF "2+2" PROGRAMS

1. Comprehensive, Coordinated, 4-year Curriculum

2. "Tech Prep" Curriculum at the Secondary Level

3. Advanced Preparation at the Postsecondary Level

4. Active Participation of Big (Business, Industry, Government)

5. Community-wide Spirit of Cooperation and Involvement

6. Comprehensive Marketing/Public Relations Effort

7. Multiple Partnerships

2 + 2 STEERING COMMITTEE

Mr. Lloyd Enoch
Roanoke City Schools

Mr. Garland Kidd
Roanoke County Schools

Mrs. Susan Kidd
Botetourt County Schools

Mr. Don Ford
Craig County Schools

Mr. Wayne Michie
Virginia Western Community College

Mr. Ron Wall
Salem City Schools

Mr. Ben Helmandollar
Roanoke County Schools

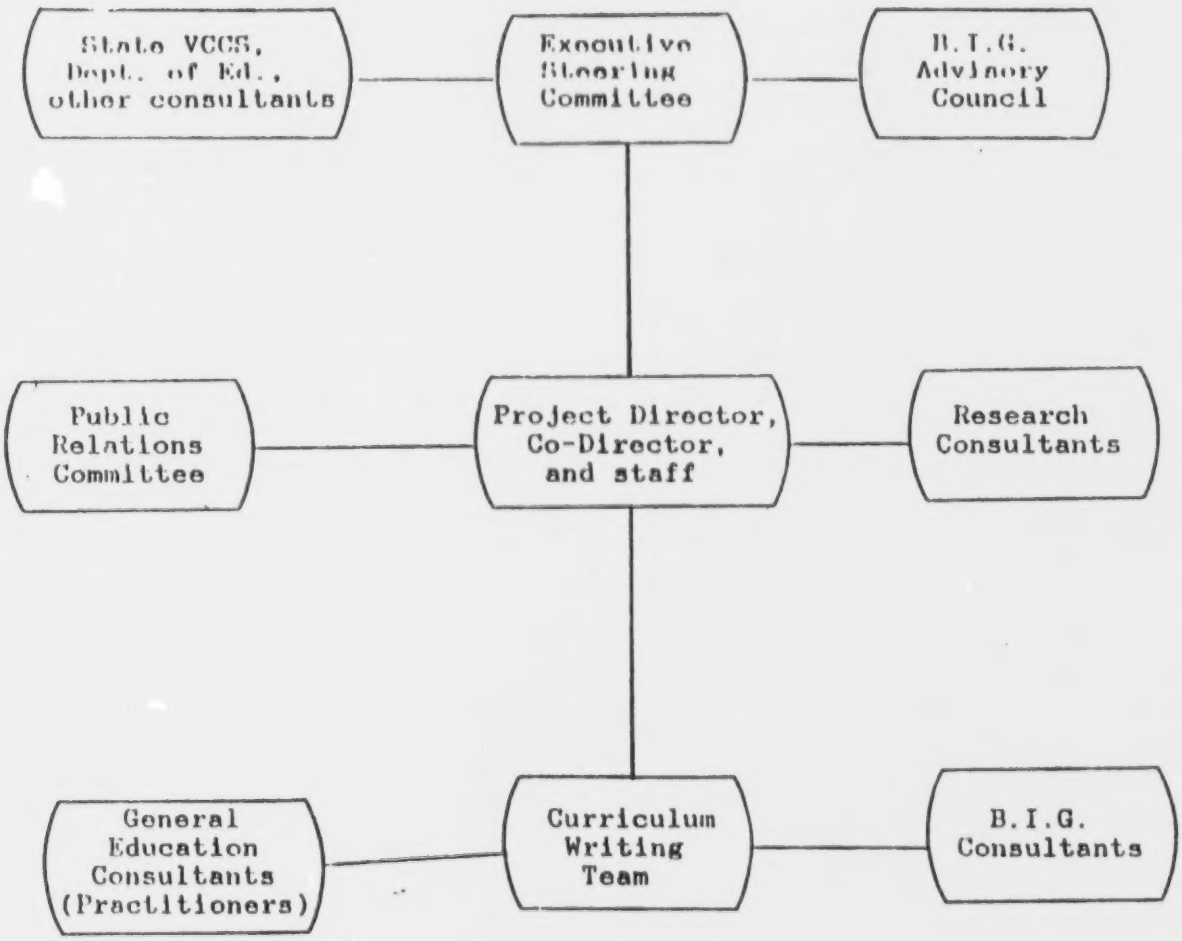
TYPES OF PARTNERSHIPS

1. Secondary/Postsecondary
2. Education/Business, Industry, Government
3. Two or More Vocational Services ("The Occupational Mix")
4. General and Vocational Education

Organizational Chart

Roanoke Area 2 + 2 Project

Automated Manufacturing Technology



KICKOFF DINNER

At the project's onset, over 200 CEO level representatives from business, industry, government, and education were brought together to pledge support for the 2+2 concept.

Steering Committee

Garland Kidd
Director of Vocational Education, Roanoke County Schools

Lloyd Enoch
Director of Vocational Education, Roanoke City Schools

Ron Wall
Director of Vocational Education, Salem City Schools

Susan Kidd
Director of Vocational Education, Botetourt County Schools

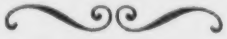
Robert Harrell
Dean of Academic & Student Affairs,
Virginia Western Community College

Monty Johnson
Principal, Arnold R. Burton Campus

Wayne Michie
2 + 2 Co-Director
Chairman Industrial & Engineering Technology Division
Virginia Western Community College

Ben Helmandollar
2 + 2 Project Director, Assistant Principal
Arnold R. Burton Campus

A special thanks to all who helped make tonight a success



Sponsoring Agencies

Roanoke County Public Schools
Roanoke City Public Schools
Botetourt County Public Schools
Salem City Public Schools
Virginia Western Community College
Virginia Department of Vocational Education

The Roanoke Area 2 + 2 Automated Manufacturing Technology Project

What is 2 + 2 ?

2 years of vocational-technical education at the High School level in manufacturing processes including strong academic preparation.

+

2 years of advanced technical education at the community college level in computer applications in manufacturing.

equals

A highly skilled Automated Manufacturing Technician

Project Features

1) Academic disciplines combined with vocational program services.

2) The cooperation of Business, Industry, Government, and Education in developing the curriculum.

3) Multiple levels of entrance and completion.

4) Designed to meet area needs.

5) A four year secondary/post secondary coordinated degree program.

Program

6:30	**Social** ..... Music by William Fleming High School Chamber Orchestra
7:00	**Welcome** ..... Monty Johnson
	Pledge of Allegiance ..... Vocational Industrial Clubs of America
	Invocation ..... Larry Hall
	Dinner ..... Prepared by Salem City Schools
	Introduction of Guest Speaker ..... Dr. Dennis Hinkle
8:00	**Keynote Address** ..... Dr. James D. McComas President, Virginia Tech
	Project Endorsements ..... Dr. Charles Downs President, Virginia Western Community College
	Dr. Bayes E. Wilson, Superintendent Roanoke County School
	Project Overview ..... Ben Helmandollar Project Director
8:30	**Adjourn**

Floral arrangements by Botetourt Technical Education Center

YEAR-END REPORT

BREAKFAST

A year-end report breakfast brought all committees together for updating and a challenge for continuation.

INDUSTRY INVOLVEMENT/DACUM

From the beginning, a major characteristic of the 2+2 project has been active participation by business and industry.

Since industry can best identify the skills needed for future demands in the workplace, area business representatives attended a two-day workshop to identify the duties and tasks necessary for the 2+2 curriculum.

About the DACUM Process

DACUM is an acronym for Developing A Curriculum. It is, in effect, a modified brainstorming process. It is considered "modified" because rather than listing all information conceived during the process, it is considered, validated, and worded correctly before it is put on paper.

The DACUM process pairs an experienced facilitator with a panel of experts in the occupation or occupational cluster under analysis. It is a very quick, effective, and low cost method of accomplishing an occupational analysis. Most full DACUMS take no longer than one and one half days to two and one half days to complete. Modified DACUMS take only a few hours to complete.

The facilitator, who is the "process" expert, guides the panel through the occupational analysis, drawing out ideas, gaining consensus, and generally keeping the discussion on target. The panel, who are the "occupational" experts, determines the components of the occupation/occupational cluster under analysis. The recorder is charged with putting the information down on paper.

The profile chart which results from a DACUM analysis is a detailed and graphic portrayal of the duties and tasks involved in the occupation/occupational cluster under analysis.

DACUM is based on three solid premises:

1. Expert workers are better able to describe/define their job than anyone else.

2. Any job can be effectively and sufficiently described in terms of the tasks that successful workers in that occupation perform.

3. All tasks have direct implication for the knowledge and attitudes that workers must have in order to perform the tasks correctly.

Although the DACUM process was originally designed for curriculum development, it has proven to be an equally valuable in other areas. Because DACUM is competency-based, educators are also able to use it for: occupational counseling and developing competency tests. Business and industry has also begun to successfully use it for: completing training needs assessments, writing job descriptions, writing performance evaluations, and recruiting.

How DACUM is Used in the Curriculum Development Process

To conduct a DACUM you need four things:

1. A panel of experts in the occupation/occupational cluster under analysis,
2. An experienced DACUM facilitator,
3. A recorder to convert verbal messages to paper, and a
4. Wall space of at least six feet.

The profile chart developed during a DACUM process is constructed on 5" x 8" index cards which are mounted on the wall. The purpose for developing the chart in this manner is that it enables the participants to move the cards within the same duty area band or from band to band.

DACUM starts with a blank wall. The panel begins by defining the occupation/occupational cluster in question.* Once the definition has been outlined, the panel begins to identify the "duty areas" of the occupation/occupational cluster. A duty area is defined as a "broad functional area or general area of responsibility." Each duty area is recorded on a card (in a distinctive color of ink - - such as red) and then mounted to the wall, one by one, in a vertical position. Once all duty areas have been identified, the panel begins identifying the tasks/competencies of each duty area - - beginning wherever they choose, but dealing with only one duty area at a time. A task/competency, or skill as they are sometimes called, is defined as an observable work activity that leads to either a product, a service, or a decision. Each identified task/competency is recorded on a card (in a different color of ink - - such as blue) and mounted on the wall horizontally from the corresponding duty area. The process continues until the panel is satisfied they have identified all, or nearly all, of the tasks/competencies required in the occupation. The finished product is a complete profile chart of the duties and tasks required of successful workers in the occupation/occupational cluster.

Using the panel of experts, you can take the process as far as you want it to go. Once duty areas and tasks/competencies are identified, you can use the panel to select a criteria (what degree of accuracy is expected) for each task/competency and/or to stratify the competencies (separate entry-level from advanced-level). Depending upon the complexity of the occupation/occupational area and what you hope to accomplish, this process can take from one and one half day (6 to 8 hours), to two and one half days (10 to 16 hours).

*If the definition has not been pre-determined.

DACUM PARTICIPANTS

Jack Pilcher, Production Engineering Manager
Fibercom Inc.
P.O. Box 11966
Roanoke, VA. 24022

Bill Laub, General Manager & Vice President
Graham-White Manufacturing Co
P.O. Box 1099
Salem, VA.

Clayton Abbott
(Same as above)

Mark Reynolds, MIS Manager
ITT Gallium Arsenide Technology
7625 Plantation Rd.
Roanoke, VA.

Jim Benton, President
Bentech Manufacturing Co.
1429 Center Ave. N.W.
Roanoke, VA. 24017

Cliff Marshall, Tooling Supervisor
Ingersoll-Rand Co.
Hollins, VA. 24019

Dick Francis, Quality Manager
(Same as above)

John Sacco, Industrial Engineering Manager
Medeco Security Locks
P.O. Box 3075
Salem, VA. 24153

Bill Marlowe, Director of Human Resources
Singer Furniture Co.
P.O. Box 5337
Roanoke, VA. 24012

C.A. Galletti, Director of Operations
Gardner-Denver Mining & Construction
1700 blue Hills Dr. N.E.
Roanoke, vA. 24012

Richard Booker, Engineer
Salem Specialties
2645 W. Main St.
Salem, VA. 24153

Mike Dudding, Plant Manager
Gala Industries

Bill Warwick
Assistant Vice President of Human Resources
Roanoke Electric Steel
102 Westside Blvd. N.W.
Roanoke, VA. 24017

John Eulon, Director of Training
NOrfolk Southern
Roanoke, VA. 24042-0078

Jim Kittleson
Manufacturing Equipment Engineer
General Electric
1501 Roke Blvd.
Salem, VA. 24153

Calon Burrus
Virginia Department of Labor & Industry

DACUM PROCEDURE COMPETENCIES

Duties and Tasks

Automated Manufacturing Technology

ASSEMBLING
- Demonstrate a knowledge of finishing, E/A
- Demonstrate a knowledge of testing, E/A
- Demonstrate a knowledge of interconnectors, E/A
- Demonstrate a knowledge of pneumatics, E/A
- Demonstrate a knowledge of hydraulics, E/A
- Demonstrate a knowledge of fixturing, E/A
- Demonstrate a knowledge of pipefitting, E
- Demonstrate a knowledge of fastening/joining, E

BASIC MATH SKILLS
- Statistics, A
- Trigonometry, E
- Algebra I & II, E
- Geometry (plane & solid),E
- Applied Technical Calculus, A

DEMONSTRATING A KNOWLEDGE OF SHOP PRACTICES AND PROCEDURES
- Explain the work flow, E
- Demonstrate the capability of identifying needed manufacturing documentation, E
- Read, interpret, and comprehend technical manuals and specifications, (Overview) E/A

DEMONSTRATING A KNOWLEDGE OF MANUFACTURING PROCESSES
- Demonstrate a basic knowledge of sheet metal fabrication, E
- Demonstrate a basic knowledge of wood working, E
- Demonstrate a basic knowledge of machine shop, E
- Demonstrate a basic knowledge of welding, E
- Demonstrate a basic knowledge of electricity/electronics, E
- Demonstrate a knowledge of the strength of materials, A
- Demonstrate a knowledge of basic fastening techniques, E
- Demonstrate knowledge of materials handling, E/A

DEMONSTRATING ACCEPTABLE WORK ATTITUDES
- Demonstrate a willingness for additional training, E
- Demonstrate an acceptable work ethic, E/A
- Demonstrate the importance of proper work attendance, E
- Demonstrate an understanding of shift work, E
- Demonstrate good interviewing skills, E
- Demonstrate the avoidance of substance abuse, E/A
- Demonstrate understanding and use of the "team" concept, E
- Demonstrate proper personal appearance, E

DEMONSTRATING MACHINE SHOP SKILLS

- Demonstrate a knowledge of machine tool setups, E
- Demonstrate a basic knowledge of the use of machine tools, E
- Demonstrate a knowledge of the machinability of different materials, E/A
- Demonstrate a knowledge of feeds and speeds, E
- Demonstrate knowledge of metal removal, E
- Accurately read measuring devices (methods), E
- Demonstrate a knowledge of cutting tools, E
- Demonstrate a knowledge of metallurgy (heat treating), E/A
- Demonstrate a knowledge of hard part (ceramics) machining, A
- Demonstrate a knowledge of casting/forging, E
- Demonstrate a knowledge of grinding, E
- Demonstrate a knowledge of machine tool programming, E/A

DEMONSTRATING QUALITY CONTROL

- Demonstrate a knowledge of SPC, E/A
- Demonstrate a knowledge of measurements, E
- Demonstrate an understanding of specifications, E
- Demonstrate a knowledge of inspection techniques, E
- Demonstrate job responsibility (understanding importance of getting job done right the first time), E
- Determine the visual acceptability of the product, E
- Explain the cost of nonconformance, E/A+
- Accurately adhere to documentation, E/A
- Demonstrate an understanding of product liability, E/A

DEMONSTRATING SUPERVISORY AND LEADERSHIP SKILLS

- Demonstrate an understanding of parliamentary procedure, E
- Demonstrate self-motivation and ability to motivate others, E/A
- Demonstrate effective speech (presentation) skills, E/A
- Demonstrate a knowledge of group analysis (quality circles, employee involvement), E
- Demonstrate a knowledge of EEO directives, A
- Demonstrate counseling and discipline skills, A

DRAFTING DESIGN

- Demonstrate a knowledge of machine fixturing, A
- Read a blueprint successfully, E
- Read schematic diagrams successfully, E
- Prepare mechanical drawings to given specifications, E/A
- Demonstrate a knowledge of geometric tolerancing, A
- Demonstrate visualization of 3-D to 2-D, E

FOLLOWING SAFETY REQUIREMENTS

- Use proper "personal" safety, E
- Demonstrate the proper use of hazardous materials. (handling, storage, disposal), E
- Demonstrate safe use of various tools & equipment, E
- Demonstrate an understanding of OSHA standards, E/A
- Demonstrate a basic knowledge of workman's compensation, E
- Demonstrate an understanding of "costs" involved with improper safety, E

Demonstrate an understanding of EPA requirements, E/A

READING/WRITING
Demonstrate basic reading comprehension, E
Demonstrate a basic knowledge of technical writing, E/A

SCIENCE
Demonstrate a basic knowledge of Physics,& Chemistry, E

TROUBLESHOOTING (PRODUCTS/EQUIPMENT)
Demonstrate a basic knowledge of troubleshooting hydraulics, A
Demonstrate a basic knowledge of troubleshooting pneumatics, A
Demonstrate a basic knowledge of troubleshooting electronics, A
Demonstrate a basic knowledge of the step by step troubleshooting process. (Decision Tree Analyses), E
Demonstrate a knowledge of the tools and test equipment used for troubleshooting, E
Demonstrate proper safety techniques, E
Explain electromechanical interaction, A

USING COMPUTER LITERACY
Demonstrate basic keyboarding skills, E
Use computer literacy, E
Demonstrate a knowledge of hardware, E
Demonstrate a knowledge of networking, E
Demonstrate the use of various forms of "canned" software, E
Demonstrate basic troubleshooting techniques, A
Demonstrate basic uses of CAD, CAM, CAPP, CIM, Computer-aided testing (Group Tech), E
Demonstrate a knowledge of Robotics, E
Demonstrate a knowledge of "BASIC", E/A
Demonstrate a knowledge of system compatability, A
Demonstrate a knowledge of computer system capabilities, E
Demonstrate DEM knowledge. (Electronic mail) E

WORKING IN WOODWORKING
Demonstrate a knowledge of woodworking tools and equipment, E
Demonstrate a knowledge of feeds and speeds, E
Demonstrate a knowledge of woodworking machine tool setups, E
Demonstrate a knowledge of different types of woods, E
Demonstrate a knowledge of the machinability of different types of woods, E
Demonstrate a knowledge of different types of adhesives/fasteners, E/A
Demonstrate a knowledge of finishing, E/A
Demonstrate a knowledge of jointery, E/A

WORKING WITH CAD SYSTEMS
- Accomplish CAD Mechanical Drawing/Drafting, A
- Demonstrate ability to design, (solids modeling), A
- Demonstrate ability to perform finite element analysis, A+
- Demonstrate a knowledge of thermal analysis, A+
- Demonstrate a knowledge of different types of CAD packages, A
- Demonstrate ability to perform "schematic capture," A

WORKING WITH CAM SYSTEMS
- Demonstrate the ability to set-up, operate, and program, A
- Demonstrate the ability to perform estimating, A
- Demonstrate knowledge of processing (routing, workflow, plant layout), A
- Demonstrate knowledge of fixture design, A
- Demonstrate knowledge of testing and gauging, E/A
- Demonstrate a knowledge of flexible manufacturing systems, A
- Demonstrate a knowledge of "firmware" and "software", A

WORKING WITH COMPUTER-AIDED TESTING SYSTEMS
- Demonstrate the setup, operation, and programming of computer-aided test equipment, A
- Demonstrate "coordination" and vision measuring, E/A
- Demonstrate a knowledge of data capture/analysis, A
- Demonstrate proper maintenance and calibration techniques for test equipment, A

WORKING WITH COMPUTER INTEGRATED MANUFACTURING
- Demonstrate a knowledge of "networking", "communications", and protocol, A+
- Demonstrate a basic knowledge ("overview") of CIM, A
- Demonstrate a knowledge of computer databases, A
- Demonstrate a knowledge of MRP, A+

WORKING WITH ELECTRICITY/ELECTRONICS
- Demonstrate high voltage system knowledge, A
- Demonstrate an understanding of analog and digital techniques, E/A
- Demonstrate a knowledge of PCB fab, A
- Demonstrate an understanding of DC and RF testing, A
- Demonstrate a knowledge of electronics test equipment, E
- Demonstrate ability to print circuit board layout, A
- Demonstrate a knowledge of power conversion, E/A
- Demonstrate a knowledge of communication networks, A
- Demonstrate basic troubleshooting techniques in electronics, E/A
- Demonstrate a knowledge of automated controls, A
- Demonstrate a knowledge of wire sizes and types, E
- Demonstrate IC fab techniques, A
- Demonstrate a basic knowledge of AC/DC circuits, E

WORKING WITH ROBOTS

Demonstrate a knowledge of setup, operation, and programming of Robots, E/A
Demonstrate a knowledge of "pick and place" units, E
Demonstrate proper material handling "to/from" Robot, A
Demonstrate proper calibration and maintenance techniques for Robots, A

WORKING WITH SHEET METAL FABRICATION

Demonstrate cutting, bending, punching techniques, E/A
Demonstrate a knowledge of bend allowances, E
Demonstrate a knowledge of different material types (hotroll, coldroll, aluminum, stainless), E/A
Demonstrate a knowledge of metal thicknesses, E
Demonstrate a knowledge of layout, E/A
Demonstrate a knowledge of fastening, E
Demonstrate a knowledge of punch and die clearance and alignment, E
Demonstrate the capability to finish (cleaning, painting, plating), E/A

WORKING WITH WELDING

Demonstrate a knowledge of different types of welding (Stick, MIG, TIG, Oxyacetylene, Spot, Carbon Arc, Specialty), E
Demonstrate a knowledge of brazing/soldering, E
Demonstrate a knowledge of inertia/bond, A
Demonstrate a knowledge of fixturing, E
Demonstrate a knowledge of percussion welding, A
Demonstrate a knowledge of metallurgy and heat treating, A
Demonstrate a knowledge of automatic burning, E
Demonstrate a knowledge of plasma cutting, E
Demonstrate safety, E

FULL DACUM PROCEDURE

INITIAL PHASE

Industry representatives spent two full days identifying duties and tasks in automated manufacturing.

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MODIFIED DACUM

VALIDATION PHASE

After extensive curriculum development work, industry representatives were reassembled on March 23, 1990, to validate the work completed by the curriculum writing team.

Duties and tasks were analyzed, deleted, and augmented in preparation for the final curriculum development phase.

MODIFIED DACUM PARTICIPANTS

MARCH 23, 1990

Harold Smelser
Graham-White Manufacturing

Robert Wimmer
Medeco Security Locks

Bert Schnoover
Ingersoll-Rand, Retired

Mike Bryant
Bryant's Welding and Machine Shop

James C. Patsell
Ingersoll-Rand

Richard Booker
Salem Specialties

John Euton
Norfolk Southern Railway

Modified DACUM Procedure Duties and Tasks List
Validation Phase

1. ORIENTING THE STUDENT
   - 1.1 Acquire a working knowledge of machine shop procedures and policies. E
   - 1.2 Acquire working knowledge of shop safety, safe operations and emergency procedures. E
   - 1.3 Coordinate workers with the work to be done. E
   - 1.4 Identify machine use and operation. E
   - 1.5 Determine the availability of supplies and materials, maintain files, and order and receive stock. E
   - 1.6 Inventory supplies and materials. E
   - 1.7 Follow up on end product control standards. E
   - 1.8 Participate in VICA activities. E

2. PERFORMING MATHEMATICAL CALCULATIONS
   - 2.1 Apply dimensions of parts from blueprint specifications to the job. E
   - 2.2 Calculate stock utilizations in machine work. E
   - 2.3 Determine material strength according to standard raw stock sizes. E
   - 2.4 Calculate the amount of material to be removed to obtain correct limits for finished work. E
   - 2.5 Calculate conversion of revolutions per minute (RPM) to surface feet per minute (SFPM). E
   - 2.6 Calculate tolerances or allowances for proper fit. E
   - 2.7 Calculate dimensions of slots and grooves. E
   - 2.8 Calculate indexing a square, a hexagon, and a gear blank. E
   - 2.9 Calculate machine speeds and feeds by formulas. E
   - 2.10 Convert to metric measurements. E
   - 2.11 Determine clearance, relief, and rake of cutting tools. E
   - 2.12 Use machining handbooks, charts, and tables to aid in mathematical calculations. E

3. DESIGNING AND PLANNING MACHINE SHOP WORK
   - 3.1 Select and identify ferrous and non-ferrous metals. E
   - 3.2 Measure, using a machinist's combination square. E
   - 3.3 Measure, using a machinist's scale. E
   - 3.5 Measure, using a spring and slip-joint caliper. E
   - 3.6 Measure, using a feeler gage. E
   - 3.7 Measure, using a depth gage and a micrometer depth gage. E

3.8 Measure, using a vernier or dial caliper. E
3.9 Measure, using a dial indicator. E
3.10 Measure, using an inside micrometer. E
3.11 Measure, using an outside micrometer. E
3.12 Measure, using snap gages. E
3.13 Determine the accuracy of precision measurement instruments, using gage blocks. E
3.14 Measure, using a surface plate. E
3.15 Measure, using a protractor. E
3.16 Measure, using a sine bar. E
3.17 Perform layout for precision machine work, using layout instruments. E
3.18 Measure, using a height gage. E
3.19 Determine standard stock dimensions and tolerances. E

4. MAINTAINING MACHINES AND TOOLS
4.1 Inspect and clean the work area for a safe working environment. E
4.2 Inspect and change drive pulleys or belts. E
4.3 Inspect and remove, replace, or adjust machine guards. E
4.4 Replace and adjust machine parts. E-A
4.5 Inspect and repair hand tools. E
4.6 Perform maintenance on lathes (turning centers) (repair/maintenance). E
4.7 Perform maintenance on milling machines. E
4.8 Perform maintenance on drill presses. E
4.9 Perform maintenance on grinders. E
4.10 Perform maintenance on power saws. E
4.11 Select coolants, cutting oils, or compounds for machining operations. A
4.12 Inspect the arbor press for safe operating conditions. E
4.13 Clean the arbor press. E
4.14 Lubricate the arbor press. E
4.15 Inspect the hydraulic press for safe operating condition. E
4.16 Clean the hydraulic press. E
4.17 Lubricate the hydraulic press. E
4.18 Clean and lubricate a vise. E
4.19 Install, inspect, level, and fasten down machines. A
4.20 Clean and store hand tools, cutters, fixtures, jigs, and attachments. E
4.21 Store grinding wheels. E
4.22 Store precision tools. E
4.23 Recycle scrap metal, chips, shavings, trash and waste materials. E
4.24 Prepare surfaces and paint machines. E

5. PERFORMING BENCH WORK
   - 5.1 Cut materials with a hand hacksaw. E
   - 5.2 Cut threads using hand taps. E
   - 5.3 Cut threads, using dies. E
   - 5.4 Disassemble and assemble parts. E
   - 5.5 Hand-sharpen cutting tools, using abrasive stones. E
   - 5.6 Ream holes, using hand reamers. E
   - 5.7 Remove and replace thread inserts. E
   - 5.8 Remove damaged screws and other non-hardened thread hardware. E
   - 5.9 Work and shape metal, using hand and hand power tools. E
   - 5.10 Clamp the work in a holding device. E
   - 5.11 Perform bench filing. E

6. PROCESSING METALS
   - 6.1 Use hardening processes. A
   - 6.2 Use softening processes. A
   - 6.3 Case-harden metals. A
   - 6.4 Temper metals. A
   - 6.5 Surface treat metals. A

7. OPERATING POWER SAWS
   - 7.1 Determine the type of material to be sawed. E
   - 7.2 Select appropriate blades. E
   - 7.3 Select and set speeds and feeds for sawing operations. E
   - 7.4 Saw to scribed lines using a metal band saw. E
   - 7.5 Measure the material and cut, using a power hacksaw. E
   - 7.6 Remove and replace saw blades. E
   - 7.7 Cut and weld a band saw blade for contour and straight sawing. E

8. OPERATING THE DRILL PRESS
   - 8.1 Identify the characteristics of the material to be drilled. E
   - 8.2 Center-punch the hole location. E
   - 8.3 Determine holding techniques. E
   - 8.4 Mount and secure the work in a holding device. E
   - 8.5 Select a tool or cutter for the drill press operation. E
   - 8.6 Secure the tool or cutter in the drill press spindle. E
   - 8.7 Select a sleeve to suit the drill. E
   - 8.8 Set the drill press feeds and speeds for the operation to be performed. E
   - 8.9 Drill a hole to size accuracy. E
   - 8.10 Sharpen the drill bit by hand, using a grinding wheel,

and check it for sharpness according to material to be drilled. E
8.11 Use a tapping attachment to tap a hole. E
8.12 Hand-tap a hole to blueprint specifications. E
8.13 Use the automatic feed on a drill press. E

9. OPERATING GRINDING MACHINES
9.1 Replace the grinding wheel. E
9.2 Dress and true the grinding wheel. E
9.3 Balance the grinding wheel. E
9.4 Perform cylindrical internal, centerless, centerless-internal grinding. A
9.5 Set up the grinder and perform the surface grinding operations. E
9.6 Measure and inspect the workpiece on the grinding machine. E
9.7 Sharpen tools on the pedestal grinder. E
9.8 Sharpen a form lathe tool. E

10. OPERATING LATHES
10.1 Select and set speeds and feeds. E
10.2 Set up tool holders, fixtures, and attachments. E
10.3 Rough-cut and finish-cut using lathe. E
10.4 Perform lathe filing. E
10.5 Knurl parts, using a lathe. E
10.6 Cut off the workpiece, using a lathe. E
10.7 Align lathe centers, using precision measurements. E
10.8 Drill holes, using a lathe. E
10.9 Countersink holes, using a lathe. E
10.10 Ream holes, using a lathe. E
10.11 Tap threads using a lathe. E
10.12 Die-cut threads using a lathe (hand threading). E
10.13 Cut short, externally tapered surfaces. E
10.14 Perform contour, angular, or radius cuts, using a lathe. E
10.15 Cut external threads on a lathe. E
10.16 Rechase threads on a lathe. E
10.17 Cut long, externally tapered surfaces, using a taper attachment. E
10.18 Cut external taper, using tailstock offset method. E
10.19 Bore holes using a lathe. E
10.20 Counterbore holes, using a lathe. E
10.21 Cut internal threads, using lathe. E
10.22 Cut internally tapered surfaces. E
10.23 Set up the turret lathe for operation. E
10.24 Die-cut threads with a lathe, using die heads. E
10.25 Perform spinning operations, using a forming tool. E-A
10.26 Set up the tool post grinder. E

10.27 Use the tool post grinder. E

11. OPERATING MILLING MACHINES
- 11.1 Align the milling machine head and fixtures. E
- 11.2 Align the milling machine attachments. E
- 11.3 Select and set speeds and feeds for milling work. E
- 11.4 Perform end milling. E
- 11.5 Perform flycutting operations. E
- 11.6 Drill holes, using a milling machine. E
- 11.7 Mill an angle. E
- 11.8 Mill cylindrical work. E
- 11.9 Perform reaming operations. E
- 11.10 Cut external keyways. E
- 11.11 Bore holes, using a milling machine. E
- 11.12 Perform cut-off operations. E
- 11.13 Perform form milling. E
- 11.14 Perform indexing operations. E
- 11.15 Mill gears. E
- 11.16 Duplicate on the profile milling machine. E
- 11.17 Perform straddle-milling operations on the horizontal mill. E
- 11.18 Mill internal slots using a slotting attachment. E
- 11.19 Inspect completed mill work. E

12. CNC PROGRAMMING AND PLANNING
- 12.1 Develop programmed instructions from blueprint. A
- 12.2 Develop programmed instructions from sample parts. A
- 12.3 Select manual or computer-assisted program. A
- 12.4 Choose machine tool for part. A
- 12.5 Select tools and holders. A
- 12.6 Select spindle speed and feeds. A
- 12.7 Position workpiece in relation to machine axis. A
- 12.8 Determine absolute or incremental mode. A
- 12.9 Compute polar/rectangular coordinates. A
- 12.10 Verify cutter path. A
- 12.11 Plot program. A
- 12.12 Depict part graphically. A
- 12.13 Program tool change procedure. A
- 12.14 Prepare operator instructions for piece part. A
- 12.15 Calculate run time. A
- 12.16 Prepare tape. A
- 12.17 Select canned cycles. A
- 12.18 Program restart points. A
- 12.19 Write manual program. A
- 12.20 Establish tolerance requirement. A
- 12.21 Design special fixtures for custom job. A
- 12.22 Add coolant commands. A
- 12.23 Write manual complex contouring program. A
- 12.24 Enter tool offset. A

12.25 Verify type of material of workpiece. A
12.26 Schedule secondary processes. A

13. SETTING UP CNC MACHINE
13.1 Check tooling sheet. E
13.2 Transport tools. E
13.3 Install cutting tools in holders. E/A
13.4 Call up program in distributed numerical control. E/A
13.5 Mount holder and tool on spindle (manually). E/A
13.6 Load automatic tool changer. E/A
13.7 Operate drawbar (manually and automatically). E/A
13.8 Place tape in reader. E/A
13.9 Mount workpiece. E/A
13.10 Set zero. E/A
13.11 Dry run program. E/A
13.12 Edit program. E/A
13.13 Alter speed/feed commands. E/A
13.14 Key in program on machine. E/A
13.15 Complete machine tool safety, (set-up.) E/A
13.16 Thread electrical discharge machine. E/A
13.17 Align holding device with machine axis. E/A
13.18 Clamp dial indicator to tool holder (set up.) E/A
13.19 Change tool holder (set up.) E/A
13.20 Set cycle dwell. E/A
13.21 Modify data input program. E/A
13.22 Set manual mode control. E/A
13.23 Select cycle modifiers. E/A

14. OPERATING CNC MACHINE
14.1 Turn on power. A
14.2 Interpret status lights. A
14.3 Perform sequence search. A
14.4 Initiate program restart from zero (absolute mode). A
14.5 Check cutting fluid. A
14.6 Check surface finish. A
14.7 Measure cut dimensions. A
14.8 Index turret. A
14.9 Differentiate between machine controls. A
14.10 Change cutting tool. A
14.11 Adjust tool offset manually. A
14.12 Reset tool cycle time. A
14.13 Remove chips. A
14.14 Execute emergency stop. A
14.15 Activate automatic cycle mode. A
14.16 Interrupt automatic cycle code manually. A
14.17 Run segment of program. A
14.18 Interpret operator related messages on screen. A

15. USING COMPUTER LITERACY
    - 15.1 Demonstrate basic keyboarding skills. E
    - 15.2 Demonstrate a knowledge of hardware. E
    - 15.3 Demonstrate a knowledge of networking. A+
    - 15.4 Demonstrate the use of various forms of "canned" software. E/A
    - 15.5 Demonstrate basic troubleshooting techniques. A
    - 15.6 Demonstrate basic uses of CAD, CAM, CAPP, CIM, CNC, DNC, Computer-Aided Testing. A
    - 15.7 Demonstrate a knowledge of "basic". E
    - 15.8 Demonstrate a knowledge of system compatability. A
    - 15.9 Demonstrate a knowledge of computer system capabilities. A
    - 15.10 Demonstrate a knowledge of electronic mail. E

16. DRAFTING/DESIGN
    - 16.1 Read a blueprint. E
    - 16.2 Demonstrate a knowledge of machine fixturing. A
    - 16.3 Read electrical schematic diagrams. A
    - 16.4 Prepare mechanical drawings to given specifications.E
    - 16.5 Demonstrate a knowledge of geometric tolerancing. A
    - 16.6 Demonstrate visualization of 2 D to 3 D. E
    - 16.7 Draw sketch of desired workpiece. E

17. DEMONSTRATING ACCEPTABLE WORK ATTITUDES
    - 17.1 Demonstrate a willingness for additional training.E/A
    - 17.2 Demonstrate an acceptable work ethic. E/A
    - 17.3 Demonstrate the importance of proper work attendance. E/A
    - 17.4 Demonstrate an understanding of shift work. E/A
    - 17.5 Demonstrate good interviewing skills. E/A
    - 17.6 Demonstrate the avoidance of substance abuse. E/A
    - 17.7 Demonstrate understanding and use of the "team" concept. E/A
    - 17.8 Demonstrate proper personal appearance. E/A

18. READING/WRITING
    - 18.1 Demonstrate a basic knowledge of technical writing. E/A
    - 18.2 Demonstrate basic reading comprehension. E/A

19. WORKING WITH CAD SYSTEMS
    - 19.1 Accomplish CAD mechanical drawing/drafting. A
    - 19.2 Demonstrate ability to design. A
    - 19.3 Demonstrate a knowledge of at least one CAD package. A
    - 19.4 Create a document using word processing. A

20. WORKING WITH CAM SYSTEMS
    - 20.1 Demonstrate the ability to set-up, operate, and program. A
    - 20.2 Demonstrate knowledge of processing. A
    - 20.3 Demonstrate knowledge of fixture design. A
    - 20.4 Demonstrate a knowledge of testing and gauging. A
    - 20.5 Demonstrate a knowledge of flexible manufacturing systems. A
    - 20.6 Demonstrate a knowledge of "firmware" and "software". A
    - 20.7 Operate post processor. A
    - 20.8 Write post processor. A
    - 20.9 Program with purchased software. A
    - 20.10 Demonstrate a knowledge of robotics. A

21. WORKING WITH COMPUTER INTEGRATED MANUFACTURING
    - 21.1 Demonstrate a knowledge of "networking" "communications" and protocol. A
    - 21.2 Demonstrate the ability to perform estimating. A
    - 21.3 Demonstrate a knowledge of computer data bases. A
    - 21.4 Demonstrate a knowledge of MRP. A

22. DEMONSTRATING SUPERVISORY AND LEADERSHIP SKILLS
    - 22.1 Demonstrate self-motivation and ability to motivate others. E/A
    - 22.2 Demonstrate effective speech presentation skills. E/A
    - 22.3 Demonstrate a knowledge of group analysis (quality circles, employee involvement). E/A
    - 22.4 Demonstrate a knowledge of EEO directives. E/A
    - 22.5 Demonstrate counseling and discipline skills. E/A

GARDNER-DENVER

PACE PROJECT

On July 18, 1989, Gardner-Denver sponsored a breakfast which was attended by dignitaries and the press celebrating the project kickoff.

Q: When will the $25,000 winner be announced?

A: The first $25,000 award will be presented to the winning school on or before May 30, 1990.

Q: Will the $25,000 winner be able to apply for a second $10,000 grant?

A: Yes, as long as the winning institution receives a second invitation to participate from Cooper's local management.

Q: What role will local Cooper managers play in this program?

A: Cooper's operations managers will be the liaison between each school and the Foundation, taking a personal interest in the success of the program. To the extent possible, the Company's intent is to foster a working partnership between its local facilities and participating schools.

Q: Why has Cooper decided to help vocational education in particular?

A: Cooper Industries is a 156-year-old diversified manufacturing company. Its product lines range from miniature electrical fuses to 35,000-horse-power turbines. The Company represents many generations of people who make things from iron and steel. Some of our employees started their careers by going to vocational technical schools. This new pilot program is our way of acknowledging their contributions to the success of our Company over the years and also a way of recognizing the schools for the important role they play in the economy.

Cooper also feels that industry as a whole needs to support vocational education, which has the potential of providing its future employees. The Company hopes this program will serve as a model to other companies seeking to assist the schools in their continuing efforts to improve the quality of vocational education and the opportunities available to their students.

Project PACE

Q: What is the purpose of Project PACE?

A: Project PACE was initiated to provide discretionary funding to help improve vocational education for high-school students.

Q: How does the program work?

A: In Cooper's pilot program, each year for three years, one vocational technical school in each of ten selected communities will be invited by the Company's local manufacturing facility to apply to Cooper Industries Foundation for a $10,000 grant. At the end of the year, each school will tell the Foundation how its grant monies were used and how the school benefited. Based on these reports, the Foundation will select one of the ten schools to receive a special, unrestricted grant of $25,000.

Q: Are there any restrictions on how the $10,000 is used?

A: The Foundation will impose no conditions on the way the grants are used except to recommend that the money be spent in one (or more) of four broad categories:

1. Teacher development and recognition;
2. Student incentives and recognition;
3. Curriculum enrichment and new technology; and
4. Community service and outreach.

Q: Are some of these categories more important to Cooper than others?

A: No, these categories were suggested to the Company by vocational education administrators and teachers.

Q: How do I apply for the first grant?

A: Simply write on your school letterhead to the Cooper manager who extended the invitation to participate in the program, saying that your school would like to participate in Cooper's Partnership for Career Education. State which category you have chosen (what problem or opportunity is involved). You do not need to spell out, at this point, exactly how the money will be used to resolve the problem or take advantage of the opportunity.

Q: When is this letter due?

A: Your letter of application should be received by Cooper's local management in time to endorse it and send it to the Foundation before June 30, 1989.

Q: When will we get the $10,000 grant?

A: A check for $10,000 payable to your school will be issued by July 15.

Q: How were the participating schools selected for this program?

A: Participation is limited to schools within a reasonable distance of one of Cooper's 100 domestic manufacturing facilities. The ten communities in the pilot program were chosen by Cooper management because the Company is a significant employer in each of them and because, in many cases, local Cooper managers were already supporting their local vocational education school in various ways. If, in the opinion of the Foundation's trustees, the pilot program is successful, the program will be extended to vocational technical schools in additional Cooper communities.

Q: Which communities have been selected for the pilot program?

A: The ten locations are Cullman, AL; Vicksburg, MS; Sedalia, MO; Olean and Syracuse, NY; Mount Vernon, OH; Sumter, SC; Amarillo, TX; Roanoke, VA; and Waukesha, WI.

Q: You say the pilot program is for three years. Does that mean the same ten schools will be invited to participate each of those years?

A: The intent of the program is for the same schools to participate all three years; however, Cooper management reserves the right to confirm or change participation annually.

Q: When are the reports on how the $10,000 was used due to the Foundation?

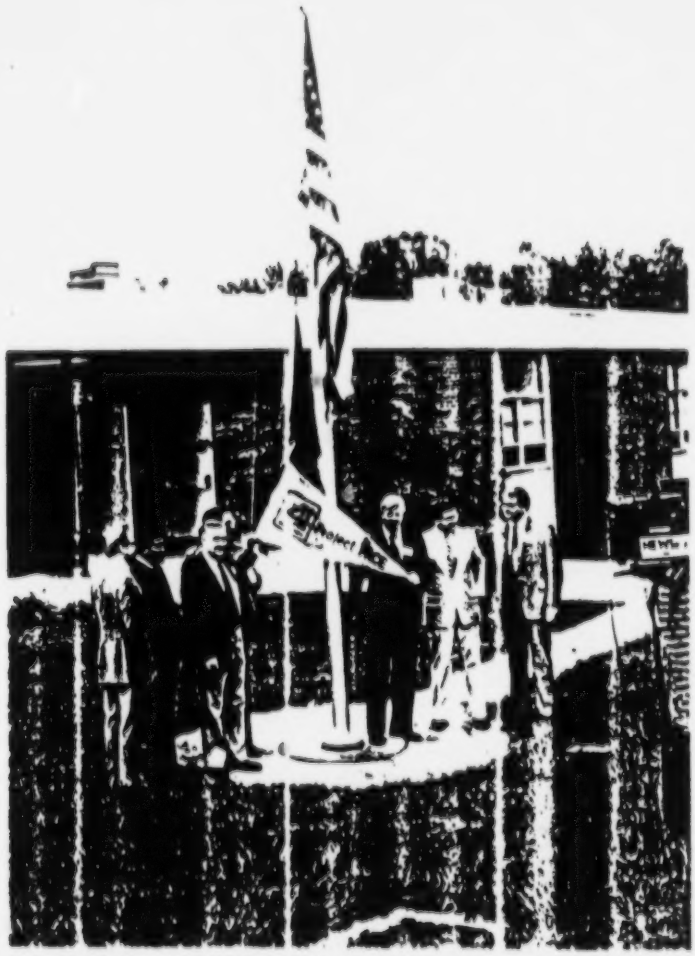
A: The first reports will be due by April 15, 1990.

Q: Should the reports be in any particular format?

A: A two- or three-page typewritten explanation of how the money was used and how the school benefited will suffice. Supporting materials may include photographs or videotapes. Quotes from students, teachers and school administrators involved with the program may also be included.

Q: What criteria will you use to select the $25,000 winner?

A: Since local needs may differ widely from school to school, no set criteria has been established. The prime consideration will be how well the funded project addresses the problem or opportunity stated in the proposal letter. Creativity and initiative also may be factors.



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PROJECT PACE

Breakfast and Presentation Ceremony

Courtesy of The Gardner-Denver Division of Cooper Industries

Tuesday, July 18, 1989

AGENDA

8:00	Breakfast	Courtesy of Gardner-Denver
8:40	2+2	Ben Helmandollar
8:45	Partnerships	Jerry Hicks
8:50	Economic Development	Dave Dixon
8:55	Project PACE	Kenneth Stevenson
9:00	Thank You	Bayes Wilson
9:05	Raising of the PACE Pennant	Kenneth Stevenson Bayes Wilson Paul Black Attendees

GUESTS

Kenneth Stevenson, President
Gardner-Denver

John McQuail, Supervisor
Employee Relations and Safety
Gardner-Denver

Russell Crawford
Manager of Manufacturing
Gardner-Denver

Garland J. Kidd, Director
Vocational Education & Adult Education
Roanoke County Schools

Dave Dixon, Director
State Department of Economic Development

Tim Gubala, Director
Roanoke County Office of
Economic Development

Ben Baines, Associate Director
Trade & Industrial Education
State Department of Education

Richard Cranwell
House of Delegates

Wayne Michie, Chairman
Division of Engineering
Virginia Western
Community College

Monty Johnson, Principal
Arnold R. Burton
Vocational-Technical School

Clyde Irwin, Coordinator
Industrial Training
Virginia Western Community College

Michael Westover, Director
Employee Relations
Gardner-Denver

Charles "Chuck" Galetti
Operations Director
Gardner-Denver

Bayes E. Wilson, Superintendent
Roanoke County Schools

Paul Black, Member
Roanoke County School Board

Bob Wills, Regional Director
VA Department of Economic
Development

Jake Lowe, Supervisor
Trade & Industrial Education
State Department of Education

Jerry Hicks, Administrative Director
Vocational and Adult Education
State Department of Education

Bob Johnson
Roanoke County Board of Supervisors

Doug McVayden
Assistant News Director
WSLS-TV

Ron Ernest, Chairman
Roanoke County Vocational & Adult
General Advisory Council

Ben Helmandollar, Director
Roanoke Area 2+2 Project

COMMONWEALTH of VIRGINIA

Office of the Governor
Richmond 23219

Gerald L. Baliles
Governor

Respond to:
Department of Economic Development
Valley Regional Office
The Stellar Center
511 Thornrose Avenue
Staunton, Virginia 24401
(703) 885-8193
332-7795

June 28, 1989

Ben Helmandollar
Assistant Principal
Arnold R. Burton Technical School
1760 Boulevard
Salem, Virginia 24153

Dear Ben:

Thank you for the information you provided this morning when I telephoned concerning the Roanoke County Technical School's, involvement in Cooper Industries Project PACE. Thanks also for the information on the Roanoke Regional 2 + 2 project, a technical school curriculum that will be developed for automated manufacturing technology. The 2 + 2 project is a new and exciting technical education program for Virginia and the Cooper Project PACE should positively complement this program.

The Virginia Department of Economic Development is the primary state agency tasked with creating new jobs for Virginians. A trained labor force is a key element to the successful marketing efforts of VDED, therefore, we are fully supportive of educational programs that will supply the labor that is needed in business and industry.

In addition to our marketing outreach program, our industrial services and industrial training programs are designed to provide assistance to industries located in Virginia. The industrial services program has a two-fold thrust. First to maintain the industry now located in the state and secondly to foster expansion of our existing industries. Gardner-Denver benefitted from the services of the Industrial Training Program when they established their new plant in the Roanoke Center for Industry and Technology.

As a result of our long association with Gardner-Denver, we would appreciate the opportunity to work with you and the Virginia Department of Education in recognizing and publicizing Cooper Industries Project PACE. I understand Cooper Industries will officially present the $10,000 grant to Roanoke County Technical

School in a ceremony in mid July. This is an event worthy of recognition by the Governor's office and as I discussed with you this morning, I invite you to contact the Director of the Virginia Department of Economic Development in Richmond. I have discussed this matter with him and he is expecting your call. His address is:

Hugh Keogh
Director
Virginia Department of Economic Development
P. O. Box 798
Richmond, Virginia 23206-0798

Telephone - 804/371-8100

We look forward to working with you and thanks you again for your assistance.

Sincerely,

Bob

Robert L. Will
Manager

RLW/bft

cc: Hugh Keogh, VDED
David Dickson, VDED
Kenneth Stevenson, Gardner-Denver
John McQuail, Gardner-Denver
Tim Gubala, Roanoke County

CURRICULUM DEVELOPMENT

The curriculum writing team has assimilated information from industry representatives, technical instructors, and nationwide curriculum sources in order to ensure that the curriculum is both up-to-date and meets the needs of industry.

2 + 2 CURRICULUM WRITING TEAM

1. * Julie Akers
English Teacher
Burton Center
1760 Boulevard
Salem, Virginia 24153

2. * J. W. Baker
Program Head
Electrical/Electronics Engineering Technology
Division of Engineering & Industrial Technologies
Virginia Western Community College
P. O. Box 14007
Roanoke, Virginia 24038

3. Lou Barlow
Assistant Principal
Patrick Henry High School
2102 Grandin Road, S.W.
Roanoke, Virginia 24015

4. Mike Beamer
Applied Physics Teacher
Burton Center
1760 Boulevard
Salem, Virginia 24153

5. Richard Browder
Physics/Math Teacher
Salem High School
400 Spartan Drive
Salem, Virginia 24153

6. Jim Bushong
Drafting Teacher
Botetourt Technical Education Center
P. O. Box 97
Fincastle, Virginia. 24090

7. Darlene Callahan
English Teacher
Lord Botetourt High School
Route 220
Daleville, Virginia 24083

* Indicates Core Writing Team

8. Cheryl Campbell
Guidance and Counseling
Lord Botetourt High School
Route 220
Daleville, Virginia 24083

9. Robert Crawford
Assistant Professor, Electronic Servicing
Division of Engineering & Industrial Technologies
Virginia Western Community College
P. O. Box 14007
Roanoke, Virginia 24038

10. Susan Foard
Patrick Henry High School
2102 Grandin Road, S.W.
Roanoke, Virginia 24015

11.* Ellen Glasgow
Math Teacher
Northside High School

12. Jim Hallis
Electronics Teacher
Gibbony Center
2200 Grandin Road, S.W.
Roanoke, Virginia 24015

13.* Bob Houseman
Assistant Professor
Welding/Machine Tool
Division of Engineering & Industrial Technologies
Virginia Western Community College
P. O. Box 14007
Roanoke, Virginia 24038

14. Harriet Hypes
Guidance Counselor
Craig County High School

15. Dirk Kepling
Guidance Coordinator
Patrick Henry High School
2102 Grandin Road, S.W.
Roanoke, Virginia 24015

16. Bill Kohler
Technology Education
Lord Botetourt High School
Route 220
Daleville, Virginia 24083

17. Andrew McClung
Engineering Teacher
Lawson Center
3649 Ferncliff Avenue, N.W.
Roanoke, Virginia 24019

18. Ted Moseley
Adjunct Faculty
Division of Engineering & Industrial Technologies
Virginia Western Community College
P. O. Box 14007
Roanoke, Virginia 24038

19.* Lacey Raines
Industrial Maintenance/Machine Shop
Botetourt Technical Education Center
P. O. Box 97
Fincastle, Virginia 24090

20.* Joseph E. Roades
Machine Tool Teacher
Gibbony Center
2200 Grandin Road, S.W.
Roanoke, Virginia 24015

21. Clinton Scudder
Technology Education
Salem High School
400 Spartan Drive
Salem, Virginia 24153

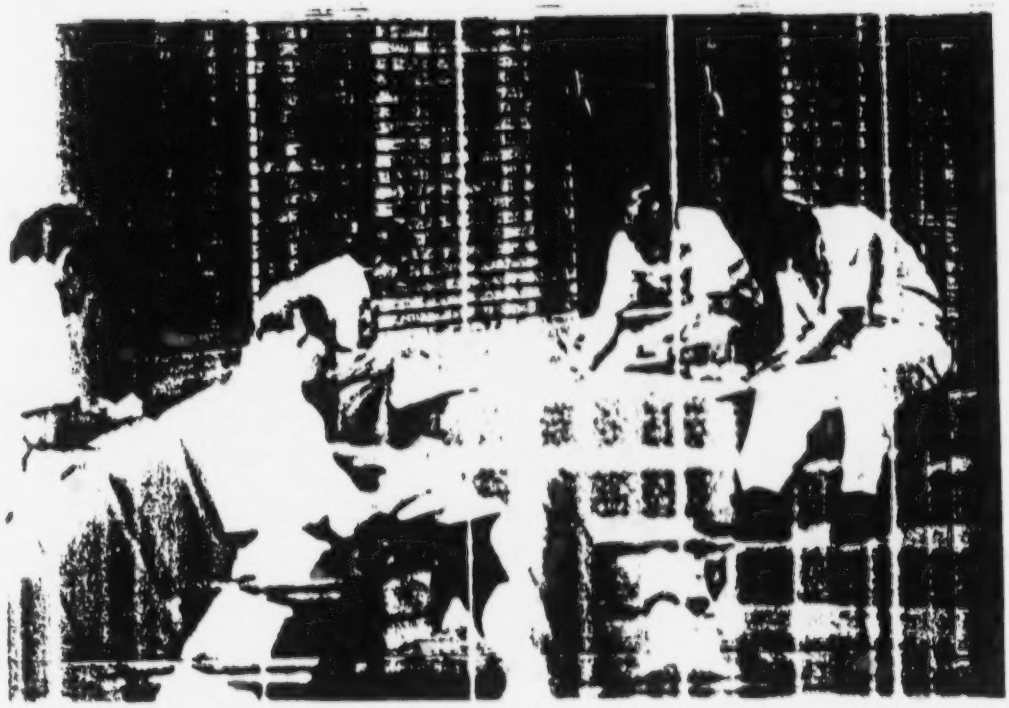
22. Charles "Chuck" Stone
Machine Shop Teacher
Burton Center
1760 Boulevard
Salem, Virginia 24153

23. Barry Thomas, Post Secondary Core Leader
CAD/CAM Instructor
Division of Engineering & Industrial Technologies
Virginia Western Community College
P. O. Box 14007
Roanoke, Virginia 24038

24. Carolyn Trainor
Mathematics/Computer Teacher
James River High School
Route 1, Box 317AA
Buchanan, Virginia 24066

25. Charles Ward
Counselor
Salem High School
400 Spartan Drive
Salem, Virginia 24153

26.* James Wright
Metal Trades Teacher
Salem High School
400 Spartan Drive
Salem, Virginia 24153



Curriculum writers attended a three-day workshop at Virginia Western Community College to learn procedures for writing competency-based curriculum. Automated manufacturing tours were given at General Electric and Gardner-Denver to see machines and industry in action.

IN-SERVICE PLAN FOR ROANOKE AREA "2 + 2" PROGRAM

Monday, July 24, 1989
Virginia Western Community College

9:00 a. m.-10:15 a. m.

Welcome	Dr. Robert A. Harrell Dean of Academic and Student Affairs Virginia Western Community College
Overview and Introductions	Wayne R. Michie Chairman, Division of Engineering/ Industrial Technology Virginia Western Community College
The Articulation Initiative	Dr. Ned K. Swartz Supervisor State Planning and Data Management Virginia Department of Education
"2 + 2" Programs: Characteristics and Partnerships	Dr. Kay B. Brown Supervisor Vocational Curriculum Development Virginia Department of Education
Case Study: Peninsula Project, Master Technician Program	Doris K. Wimmer Assistant Director Vocational Education Hampton City Schools
Critical Success Factors in the Development of "2 + 2" Programs	Robert Merchant Project Coordinator Electricity/Electronics Technology Program Central Virginia Community College
The Roanoke Area "2 + 2" Project in Automated Manufacturing	Ben Helmandollar Project Director Automated Manufacturing Technology Program

10:15-10:30 a. m. Coffee Break

10:30-12:00 Noon

Curriculum Concepts and Applications	Dr. Kay Brown
Review of Competency-Based Education	
Levels of Curriculum Development	
Infusion of Basic Skills: Blending of General and Vocational Education	
Format, Form, and Style	Dr. Phil R. Phelps Writer/Editor Virginia Vocational Curriculum and Resource Center
Components of the Guide	
Development Standards	

12:00 Noon-1:00 p. m.

Luncheon	Virginia Western Community College Cafeteria

1:00-3:00 p. m.

Curriculum Development Practice Session	Facilitators: Dr. Ned Swartz Dr. Kay Brown Doris Wimmer Robert Merchant Dr. Phelps
Summary and Next Steps	Dr. Kay Brown

ROANOKE AREA 2 + 2
CURRICULUM DEVELOPMENT
WORKSHOP
JULY 24, 1989

REACTION SHEET

Please circle the appropriate number after each statement.

		Strongly Agree		Strongly Disagree		
1.	This workshop was informative to me.	4	3	2	1	NA
2.	This awareness session gave me a flavor of the scope, magnitude and direction for curriculum work.	4	3	2	1	NA
3.	The presentations were well organized.	4	3	2	1	NA
4.	The visual aids were understandable.	4	3	2	1	NA
5.	The visual aids were useful.	4	3	2	1	NA
6.	The written materials were understandable.	4	3	2	1	NA
7.	The written materials were useful.	4	3	2	1	NA
8.	I had an opportunity to interact with the presenters.	4	3	2	1	NA
9.	There were opportunities to interact with other participants.	4	3	2	1	NA
10.	The session seemed too rushed.	4	3	2	1	NA
11.	The session seemed too slow.	4	3	2	1	NA

Please comment.

1. What were the strengths of this workshop?

_____

_____

_____

_____

Page Two

2. What could have been changed to make it better?

---

3. Other comments:

Please return this completed form to the workshop presenters.
Thank you for your cooperation.

ROANOKE AREA 2 + 2
CURRICULUM DEVELOPMENT
WORKSHOP
JULY 25, 26

REACTION SHEET

Please circle the appropriate number after each statement.

		Strongly Agree			Strongly Disagree	
1.	The workshop was well organized.	4	3	2	1	NA
2.	The task directions were understandable.	4	3	2	1	NA
3.	The tours were useful.	4	3	2	1	NA
4.	The strategy to follow from here is clear to me.	4	3	2	1	NA
5.	I had an opportunity to interact with the presenters.	4	3	2	1	NA
6.	There were adequate opportunities to interact with other participants.	4	3	2	1	NA
7.	The session seemed too rushed.	4	3	2	1	NA
8.	The session seemed too slow.	4	3	2	1	NA

Please comment.

1. What were the strengths of this workshop?

_____

_____

_____

_____

2. What could be changed in the next workshop to make it better?

_____

_____

_____

3. Other comments:

_____

_____

_____

Please return this completed form to the workshop presenters.
Thank you for your cooperation.

A small sample

of curriculum materials

in selected duty areas

as developed by

curriculum

writers . . .

CONCEPT/DUTY AREA

1. ORIENTING THE STUDENT

ESSENTIAL SECONDARY TASKS

TASKS/COMPETENCIES

1.1 Acquire a working knowledge of machine shop procedures and policies

1.2 Acquire a working knowledge of shop safety, safe operations, and emergency procedures

1.3 Coordinate workers with the work to be done

1.4 Identify machine use and operation

1.5 Determine the availability of supplies and materials, maintain files, and order and receive stock

1.6 Inventory supplies and materials

1.7 Follow up on end-product control standards

1.8 Participate in VICA activities

CONCEPT/DUTY AREA

2. PERFORMING MATHEMATICAL CALCULATIONS

ESSENTIAL SECONDARY TASKS

TASKS/COMPETENCIES

2.1 Apply dimensions of parts from blue print specifications to the job

2.2 Calculate stock utilizations in machine work

2.3 Determine material strength according to standard raw stock sizes

2.4 Calculate the amount of material to be removed to obtain correct limits for rework

2.5 Calculate the conversion of revolutions per minute (RPM) to surface feet per minute (SFPM)

2.6 Calculate tolerances or allowances for proper fit

2.7 Calculate dimensions of slots and grooves on special setups

2.8 Calculate indexing a square, hexagon, and a gear blank

2.9 Calculate machine speeds and feeds by formulas

2.10 Convert to metric measurements

2.11 Determine clearance, relief, and rake of cutting tools

2.12 Use machining handbooks, charts, and tables to aid in mathematical calculations

CONCEPT/DUTY AREA

3. DESIGNING AND PLANNING MACHINE SHOP WORK

TASKS/COMPETENCIES

3.1 Select and identify ferrous and non-ferrous metals

3.2 Measure, using a machinist's combination set

3.3 Measure, using a machinist's rule

3.4 Measure, using a slide caliper rule

3.5 Measure, using a spring and slip-joint caliper

3.6 Measure, using a feeler gage

3.7 Measure, using a depth gage and a micrometer depth gage

3.8 Measure, using a vernier or dial caliper

3.9 Measure, using a dial indicator

3.10 Measure, using an inside micrometer

3.11 Measure, using an outside micrometer

3.12 Measure, using snap gages

3.13 Determine the accuracy of precision measurement instruments, using gage blocks

3.14 Measure, using a surface plate

3.15 Measure, using a protractor

3.16 Measure, using a sine bar

3.17 Make sketches of parts to be machined

3.18 Perform layout for precision machine work, using layout instruments

3.19 Measure, using a height gage

3.20 Check the layout, using gage blocks

3.21 Measure stock

CONCEPT/DUTY AREA

4. MAINTAINING MACHINES AND TOOLS

TASKS/COMPETENCIES

4.1 Inspect the work area for a safe working environment

4.2 Inspect and change drive pulleys or belts

4.3 Inspect and remove, replace, or adjust machine guards

4.4 Remove machine parts

4.5 Replace and adjust machine parts

4.6 Inspect and repair hand tools

4.7 Perform maintenance on lathes

4.8 Perform maintenance on milling machines

4.9 Perform maintenance on drill presses

4.10 Perform maintenance on grinders

4.11 Perform maintenance on power saws

4.12 Select coolants, cutting oils, or compounds for machining operations

4.13 Inspect the arbor press for safe operating condition

4.14 Clean the arbor press

4.15 Lubricate the arbor press

4.16 Inspect the hydraulic press for safe operating condition

417 Clean the hydraulic press

4.18 Lubricate the hydraulic press

4.19 Clean and lubricate a vise

4.20 Install, inspect, level, and fasten down machines

4.21 Clean and store hand tools, cutters, fixtures, jigs, and attachments

CONCEPT/DUTY AREA

5. PERFORMING BENCH WORK

TASKS/COMPETENCIES

5.1 Cut materials with a hand hacksaw

5.2 Cut threads, using hand taps

5.3 Cut threads, using dies

5.4 Disassemble and assemble parts

5.5 Hone and lap surfaces

5.6 Hand-sharpen cutting tools, using abrasive stones

5.7 Ream holes, using hand reamers

5.8 Remove and replace thread inserts

5.9 Remove damaged screws and other non-hardened thread hardware

5.10 Work and shape metal, using hand tools

5.11 Clamp the work in a holding device

5.11 Clamp the work in a holding device

5.12 Perform bench filing

CONCEPT/DUTY AREA

6. USING THERMAL PROCESSES OF METALS

TASKS/COMPETENCIES

6.1 Use hardening processes

6.2 Use softening processes

6.3 Case-harden metals

6.4 Temper metals

6.5 Use special hardening processes

CONCEPT/DUTY AREA

7.OPERATING POWER SAWS

TASKS/COMPETENCIES

7.1 Determine the type of material to be sawed

7.2 Select appropriate blades

7.3 Select and set speeds and feeds for sawing operations

7.4 Saw to scribed lines, using a metal band saw

7.5 Measure the material and cut, using a power hacksaw

7.6 Remove and replace saw blades

7.7 Cut and weld a band saw blade for contour sawing

CONCEPT/DUTY AREA

8.OPERATING DRILL PRESS

TASKS/COMPETENCIES

8.1 Identify the characteristics of the material to be drilled

8.2 Center-punch the hole location

8.3 Determine holding techniques

8.4 Mount and secure the work in a holding device

8.5 Select a tool or cutter for the drill press operation

8.6 Secure the tool or cutter in the drill press spindle

8.7 Select a sleeve to suit the drill

8.8 Set the drill press feeds and speeds for the operation to be performed

8.9 Drill a hole to size

8.10 Sharpen the drill bit by hand, using a grinding wheel, and check it for sharpness

8.11 Sharpen the drill, using a grinding wheel

8.12 Ream the hole to size

8.13 Spotface the workpiece

8.14 Countersink a hole to drawing requirements

8.15 Drill and counterbore a hole

8.16 Use a tapping attachment to tap a hole

8.17 Hand-tap a hole to blue print specifications

8.18 Use the automatic feed on a drill press

CONCEPT/DUTY AREA

9. OPERATING GRINDING MACHINES

ESSENTIAL SECONDARY TASKS

TASKS/COMPETENCIES

9.1 Replace the grinding wheel

9.2 Dress and true the grinding wheel

9.3 Balance the grinding wheel

9.4 Use a hand-held utility grinder

9.5 Set up the grinder to run the workpiece on a magnetic chuck

9.6 Set up the grinder and perform the surface grinding operations

9.7 Measure, inspect, and rework the workpiece on the grinding machine

9.8 Sharpen tools on the pedestal grinder

9.9 Sharpen a preshaped lathe tool

CHECKLIST (PL1.5)*

CHECKLIST; DETERMINE AVAILABILITY OF SUPPLIES AND MATERIALS NEEDED FOR MACHINING WORK

ACTIVITY	RATING	
	ACCEPTABLE	UNACCEPTABLE
1. Determined supplies and materials needed		
2. Identified supplies and materials on hand		
3. Ordered or reordered stock		
4. Recorded and stored received stock		
5. Maintained requisition records and work order files		

(All activities should be performed acceptably.)

*Vocational-Technical Education Consortium of States, A Catalog of Performance Objectives, Criterion-Referenced Measures and Performance Guides for Machine Shop (Georgia: Georgia Department of Education, n.d.), P. 12.

CONCEPT/DUTY AREA: COURSE:

1. ORIENTING THE STUDENT

TASK/COMPETENCY:

1.1 Acquire a working knowledge of machine shop procedures and policies

PERFORMANCE OBJECTIVE

P1.1 Given introductory materials, text, guides, and a syllabus, demonstrate familiarity with accepted procedures and policies for working in the machine shop.

CRITERION-REFERENCED MEASURE

C1.1 Demonstrate familiarity with the accepted procedures and policies for working in the machine shop.

ENABLING OBJECTIVES/LEARNING ACTIVITIES

E1.1.1 Review the text, course syllabus, and course objectives.

E1.1.2 Clean and test the lockers.

E1.1.3 Check the aprons and glasses.

E1.1.4 Explain student and teacher responsibilities

CONCEPT/DUTY AREA:

1. ORIENTING THE STUDENT

COURSE:

Metal Technology
(8349)
Machine Shop I
(8539)
Metals Trades I
(8548)
MECH 111/131/137
(VCCS)

TASK/COMPETENCY:

1.2 Acquire a working knowledge of shop safety, safe operations, and emergency procedures

PERFORMANCE OBJECTIVE

P1.2 Given the Occupational Safety and Health Act (OSHA) of 1970 standards, outline and discuss the shop safety equipment maintenance, safe operations, and machinery setup as specified in the OSHA standards.

CRITERION-REFERENCED MEASURE

C1.2 Identify safety equipment maintenance, safe work habits, and shop layout and safety procedures as specified in the OSHA standards.

SELECTED ENABLING OBJECTIVES/LEARNING ACTIVITIES

E1.2.1 Describe the repair of safety equipment (e.g., eye safety shield over the grinding wheel or tool rest).

E1.2.2 Make repairs and adjustments of safety devices.

E1.2.3 Identify and correct the safety hazards in the shop.

E1.2.4 Identify the emergency equipment and procedures.

CONCEPT/DUTY AREA: **COURSE:**

1. ORIENTING THE STUDENT

TASK/COMPETENCY:

1.3 Coordinate workers with the work to be done

PERFORMANCE OBJECTIVE

P1.3 Given job specifications, appropriate tools, and equipment, coordinate workers with the work to be done, incorporating activities according to specifications outlined by the instructor.

CRITERION-REFERENCED MEASURE

C1.3 Coordinate workers with work to be done, incorporating activities according to specifications outlined by the instructor.

ENABLING OBJECTIVES/LEARNING ACTIVITIES

E1.3.1 Determine the work to be done.

E1.3.2 Determine the availability of materials, tools, and supplies.

E1.3.3 Specify the proper machinery and equipment for the job(s).

E1.3.4 Determine the availability of machinery and equipment.

E1.3.5 Lay out the work to be done by reviewing worker skills and specialties, developing sequence of operations, and providing for lapover time.

E1.3.6 Schedule job assignments.

CONCEPT/DUTY AREA:

1. ORIENTING THE STUDENT

COURSE:

MACHINE SHOP(17.2302)

TASK/COMPETENCY:

1.4 Identify machine use and operation — Machine Shop I (8539), Metals Trades I (8548), MECH 111/131/137

PERFORMANCE OBJECTIVE

P.1.4 Given access to shop machinery, identify proper machinery use and operations according to the specified activities outlines by the instructor.

CRITERION-REFERENCED MEASURE

C1.4 Identify proper machinery use and operations according to the specified activities outlined by the instructor.

ENABLING OBJECTIVES/LEARNING ACTIVITIES

E1.4.1 Identify preventive maintenance procedures, unscheduled maintenance procedures, repair manuals, and technical publications related to machine shop equipment.

E1.4.2 Identify new part replacement and determine the factors which provide for economical replacement.

E1.4.3 Determine the cause of downtime and initiate repairs.

E1.4.4 Demonstrate proper machine operations.

CONCEPT/DUTY AREA:

1. ORIENTING THE STUDENT

COURSE:

MACHINE SHOP (17.2302)

TASK/COMPETENCY:

1.5	Determine the availability of supplies and materials, maintain files,and order and receive stock.	Machine Shop I (8539) Metals Trades I (8548) MECH 111 (VCCS)

PERFORMANCE OBJECTIVE

P1.5 Given an inventory list, reorder level, and job specifications, determine the availability of supplies and materials needed for machine work. Order supplies and materials so that they will be available when needed and update the inventory records. Each activity on the attached checklist must be performed acceptably.

CRITERION-REFERENCED MEASURE

C1.5 Using the supplied inventory list and information on reorder level, determine the availability of supplies and materials needed for machine work. Order those needed and update the inventory records to meet shop needs. Each activity on the attached checklist must be performed acceptable.

ENABLING OBJECTIVES/LEARNING ACTIVITIES

E1.5.1 Identify supplies and materials needed fo perform preventive maintenance, unscheduled maintenance, and normal shop operations.

E1.5.2 Explain the application and use of repair manuals and technical publications.

E1.5.3 Discuss methods of determining when a defective part can be more economically repaired or replaced.

CONCEPT/DUTY AREA:

1. ORIENTING THE STUDENT

COURSE:

MACHINE SHOP (17.2302)

TASK/COMPETENCY:

1.7 Follow up on end-product control standards

Machine Shop I (8539)
Metals Trades I (8548)
MECH 114 (VCCS)

PERFORMANCE OBJECTIVE

P1.7 Given a series of finished products which have been inspected, a blueprint, and precision measurement instruments, follow-up on end-product quality control according to blueprint specifications. On a one-of-a-kind product, each unit must be inspected. On mass-produced products, a given number of unit samples must be inspected.

CRITERION-REFERENCED MEASURE

C1.7 Follow up on end-product quality control standards according to blueprint specifications.

ENABLING OBJECTIVES/LEARNING ACTIVITIES

E1.7.1 Determine the product standards from the blueprint specifications.

E1.7.2 Determine which measuring instruments to use.

E1.7.3 Inspect and measure each one-of-a-kind product.

E1.7.4 Inspect and measure samples of mass-producted products.

E1.7.5 Reject or pass the units according to the quality control standards.

E1.7.6 Demonstrate blueprint reading.

E1.7.7 Demonstrate the use of precision measuring equipment and instruments.

PUBLIC RELATIONS

Recognizing the need for attracting students capable of combining strong academic preparation with technical skills training, a strong public relations effort has been undertaken to inform the public, parents, and students of opportunities in the 2+2 program.

PUBLIC RELATIONS

ADVISORY COMMITTEE

Elaine Woolwine, Chairperson
Roanoke City Schools

Tim Gubala
Director of Economic Development
Roanoke County

Robert Downey
General Manager
Salem Times Register

Doug McVayden
News Director
WSLS-TV, Channel 10

Sandy Akers
Director of Relocation and Corporate Services
Owens & Company Realty

Fred Halley
Gardner-Denver Mining and Construction

Tim Finton
RTV Production and Broadcasting
Virginia Western Community College

Ben Helmandollar
2+2 Project Director
Roanoke County Schools

Richard Turner
Marketing and Adult Education
Roanoke County Schools

Mike Zindorf
District Manager
Madison and Associates Marketing

Ron Ernest
Vice President
Credit Marketing & Management Association

Clyde Irwin
Virginia Western Community College

Kathie Spear-Bennison
Graphic Productions

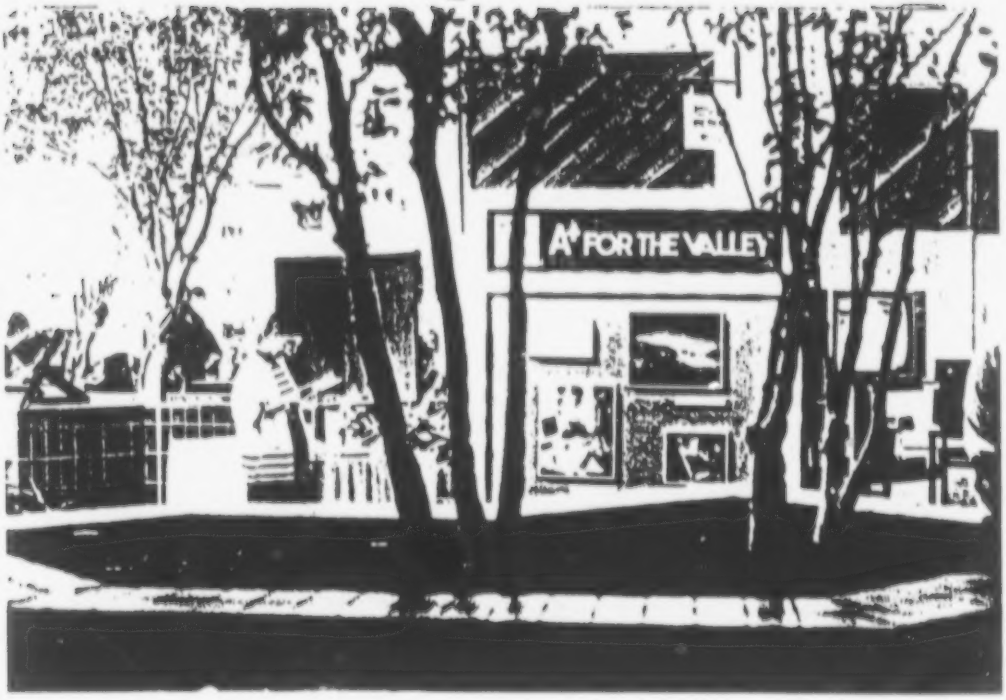
Becky Arrington
Roanoke County Schools

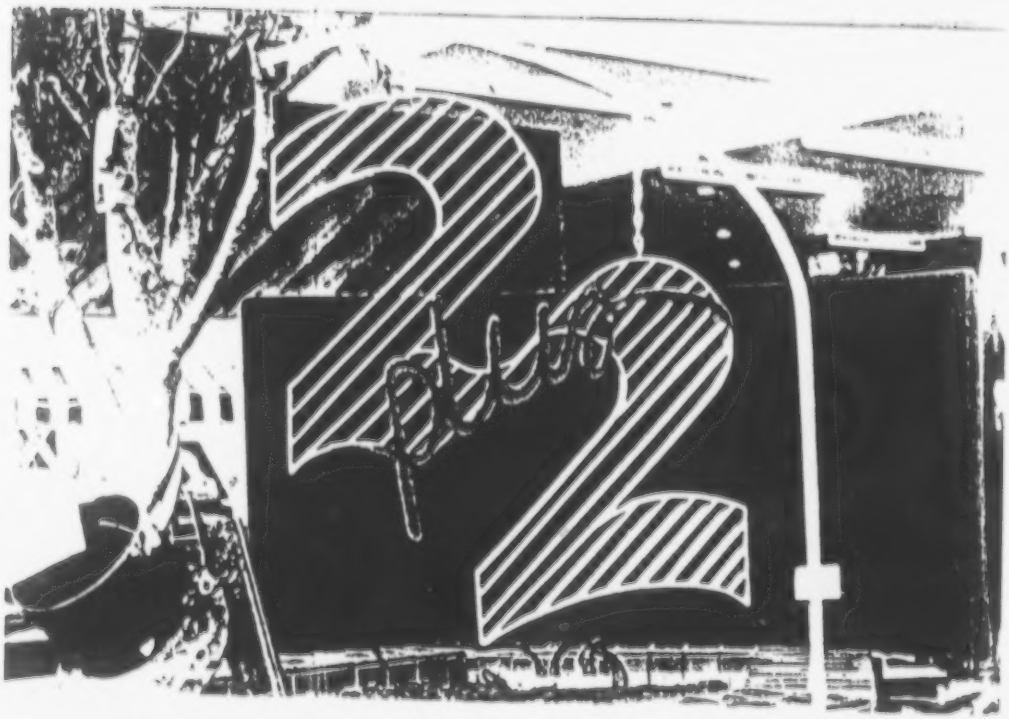
JoAnn Lehman
Roanoke County Schools

A+ FOR THE VALLEY

A logo and slogan were developed to symbolize the industry/education partnership and the 2+2 theme.

A recent mall show during National Vocational Education Week 1990 featured a trade show style exhibit which was produced for public, industry, and school settings.





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2 plus 2
A+ for the Valley
30

2+2 brings together industry, government, and education in an exciting new partnership to provide training for the 90's.

The Roanoke area 2+2 program in Automated Manufacturing Technology begins with 2 years of high school followed by 2 years of advanced technical training with further college options. 2+2 prepares graduates for tomorrows careers.

2+2 is a cooperative effort of area industries, government, and education. The educational agencies involved include:

- Roanoke County Schools
- Roanoke City Schools
- Botetourt County Schools
- Salem City Schools
- Craig County Schools
- Franklin County Schools
- Virginia Western Community [illegible]ge

The 2+2 program is specifically developed for a "new breed" of student- highly motivated and capable of combining strong academic preparation in math, science, computer, and communication skills with state-of-the-art technical training. 2+2 training in automated manufacturing technology leads to a high paying, high demand career.

Students may enter and exit the program at many levels with varied career options. These include: 1) entry level jobs with a high school diploma, 2) technician positions with an Associate degree, and 3) careers as a technologist with a Bachelors degree.

Industry and public involvement is encouraged and appreciated. To become a part 2+2 contact the technical education director at any of the above educational agencies.

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2+2 A+ for the Valley

The Roanoke Valley benefits from the 2+2 program through:

- Cooperation among business, industry, government, and education to meet the economic and employment needs of tomorrow.
- Training of skilled technicians for an increasing demand in Automated Manufacturing Technology.
- Innovative, quality educational programs to attract clean industry and enhance lifestyles.

2+2 A+ for Students

Students benefit by receiving:

- Training for high demand, high paying jobs of the future.
- Strong academic preparation blended with technical skills training in a four year degree program.
- Hands-on activities with state-of-the-art technology.

- Opportunities to earn while learning with options for advanced college degrees.

2+2 A+ for Industry

Industry and business receive:

- Computer experienced employees from the local job market with high-tech training in Automated Manufacturing Technology.

- Reduced retraining and education costs.
- Involvement in developing a curriculum tailored to industry needs.
- Employees trained through customized, quality education for "zero setup, lot one, just in time," production.

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ROANOKE COUNTY TODAY

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September 1989 | The Official Newsletter of Roanoke County, Virginia | Vol. 4, No. 6

A new flag flies at Arnold R. Burton Voc-Tech School. Pictured from left to right are Superintendent of Schools Bayse Wilson, Supervisor Bob Johnson, School Board Member Paul Black, Garland Kidd from Roanoke County Schools, Ken Stevenson, President of Gardner Denver, Dave Dickson of the Virginia Economic Development Department and Jerry Hicks of the Virginia Department of Education.

Roanoke County School Receives Grant From Cooper Industries

Roanoke County's Arnold R. Burton Vocational-Technical School received a $10,000 grant from Cooper Industries' Project PACE to fund a portion of the "2 + 2" project which teaches automated manufacturing technology.

The program involves two years of high school academic and technical training with two years of vocational training at the community college level. School systems in the Counties of Roanoke, Botetourt and Craig, the Cities of Salem and Roanoke, and Virginia Western Community College are involved in the program.

Cooper Industries sponsors Project PACE (Partnership to Aid Career Education) in ten communities where the company has manufacturing facilities. The money will be used for curriculum development and public outreach. A campaign will be initiated in September to create awareness for the program. Students are expected to enroll in January for the beginning program in the fall of 1990.

By 1994, the first "2 + 2" graduates in automated manufacturing technology should be entering the Valley work force to seek employment as industrial technicians, laboratory technicians, and automated machine tool operators.

Roanoke County 1 Roanoke Times & World News, Wednesday

Vocational education gets industry boost

By ETHAN ARRINGTON
staff writer

Several Roanoke Valley businesses have joined forces with area colleges and schools to start an educational program that aims to teach vocational students technical skills now in demand in the valley.

Officials at Arnold R. Burton Technical School plan to introduce the new "2+2" Project in Automated Manufacturing Technology for representatives of industry, government and education at a 6:30 dinner meeting at the Salem school tonight.

Ben Helmandollar, director of the project, said tonight's meeting will give him the chance to explain how the project will work and how industry can help it.

According to Helmandollar, students who participate in the project begin in high school and take two years of special academic and vocational courses. They later move on to vocational programs at the community college level for two more years.

Ideally, the student who completes all four years in a certain field — such as welding or drafting — is ready to operate and program computerized machinery associated with their field.

Helmandollar said many local industries have reduced labor costs by gradually switching from manual labor to computerized machinery. The problem that valley businesses face, he said, is that there are few technical workers trained to operate the computers.

Dick Francis, manager of quality assurance for Ingersoll-Rand, which manufactures machinery, said his company is facing such a problem as it moves over to more complicated equipment.

"Right now, we're having to train people from scratch. We're spending a lot of time and money training individuals to bring them up to time and speed," Francis said.

"It would be highly beneficial to industry to have some qualified people to draw from."

Michael Westover, director of employee relations at Gardner Denver Mining & Construction, also finds it difficult to get qualified help. He said his company would give special consideration to graduates of the new program.

"I certainly think the background they pick up in the program will give them an advantage in the job market," Westover said.

"We'd look favorably on someone who has shown the dedication and discipline it would take to complete such a program."

Besides Burton, others agreeing to participate in the program are Roanoke, Roanoke County, Salem and Botetourt County school systems. Virginia Western Community College and Virginia Tech also will be involved.

Among the businesses that have agreed to help with the program are Ingersoll-Rand, Medeco Lock, Norfolk Southern Corp., Gardner-Denver Mining & Construction, General Electric and Roanoke Electric Steel.

Helmandollar said he will ask

PLEASE SEE **PROGRAM**/B14

Program

FROM PAGE B1

business leaders tonight to later send representatives to the colleges and schools to help with the actual designing of the project curriculum.

Thus, he said, industry will play a dual role in establishing "2+2" — first, to help write the courses students need to take and second to hire students who complete the program.

"Basically, we're asking industry what are your projected needs and how can we train students to meet those needs?" Helmandollar said.

"The whole rationale is that if these are your needs and we train them [students] to meet them, you'll likely hire them when the jobs become available."

Funding for the program comes from the Virginia Department of Vocational Education, which has committed a $40,000 grant each year for two years to its implementation, Helmandollar said.

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Arnold Burton gets grant

By James F. Swasey
Staff Writer

In years past, a high school graduate's decision to attend a vocational-technical school was seen by many parents and educators as a decision less than favorable.

While colleges and universities enjoyed soaring enrollments and the prestige of their collective programs and research, the vo-tech schools continued training mechanics, plumbers, carpenters and many other so called "blue collar" careers with little fanfare but plenty of graduates who found meaningful employment.

As the industrial nations have embraced technology ever closer to their bosom in the end of the 20th century, the advanced training and skills required by modern manufacturing plants continues to intensify. Major corporations have instituted cooperative programs through grants and funds to help keep educational training at a world-wide competitive level and to keep pace with the fast pace of advancing technology.

In the Roanoke Valley, the Arnold R. Burton Vocational Technical School of Salem has joined forces with area businesses in an effort to increase communications between education and industry.

On Tuesday, July 18, 1989, officials from industry and education gathered at the vo-tech school to witness the latest development in the growing relationship between private industry and public education.

Gardner-Denver, a division of Cooper Industries, donated $10,000 through their Project Pace program to vocational and adult education, specifically the 2 & 2 program in automated manufacturing technology.

Project PACE provides cash contributions to vocational-technical schools in 10 communities across the country where Cooper has manufacturing facilities. The program has been widely acclaimed as an exemplary partnership between business and education that helps provide workers who are well-prepared for the futuristic jobs of tomorrow.

"I think it's critically important throughout Virginia that industry gets more actively involved in local school systems," said Dave Dickson, the director of Community and Business Services for the State Department of Economic Development. Dickson added that a program advisory committee is a "vehicle already in place that industry should be represented on."

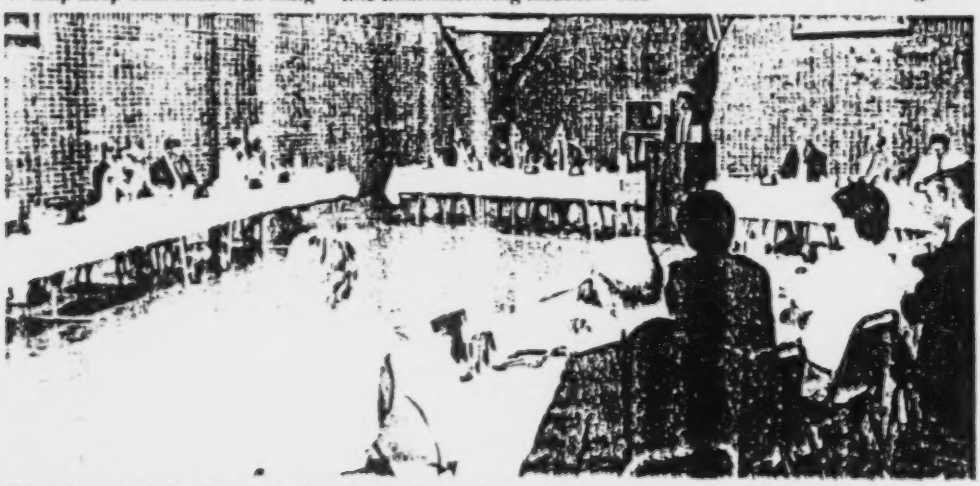
"Once industry is on the advisory committee they should speak out and let the school systems know the kinds of curriculums that are important to them," Dickson said.

Ken Stevenson, the president of

See GRANT, Page 7

'Workers need to be highly trainable because of the equipment changes so rapidly.'

Ben Helmandollar, the Roanoke area director for the 2 & 2 project, speaks on behalf of vocational and adult education's benefits to automated manufacturing technology in local business.



Educators and business leaders from throughout Virginia met for breakfast and a special presentation ceremony celebrating Cooper Industries' Project Pace program and the Roanoke County 2 & 2 program.

Ken Stevenson, the president of Roanoke-based Gardner-Denver division of Cooper Industries, presented a check for $10,000 to be used in the Roanoke County Schools 2 & 2 program.

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Grant

Continued from Page 6

Gardner-Denver in Roanoke, agreed that it is hard to find qualified help during this period of advancing technology and ever-changing job skills. "I think the demands are going up, and it is difficult to find people to fill those jobs. That's one of the reasons we're interested in promoting this program."

"This is a new program for Cooper Industries. It's just starting this year," said Stevenson. "We are a manufacturing company, that's our business to make products, and we think it is essential to provide the training and the education for people to be able to build a career in manufacturing." Cooper Industries is a large diversified company, while the Roanoke based Gardner-Denver makes rock-drilling equipment and air compresses for use in the mining and construction industry.

The local 2-plus-2 program is basically two years of vocational training plus two years of community education. Gardner-Denver has supported the program all along, according to Ben Helmandollar, director of the Roanoke 2 + 2 project and assistant principal at Arnold Burton Tech School. "We are asking industry, 'what do we need to be teaching our students, in order to fill your needs,' " said Helmandollar. Automated manufacturing technology is currently riding a wave of growth in the valley.

'I think it's critically important throughout Virginia that industry get more actively involved in local school systems.'

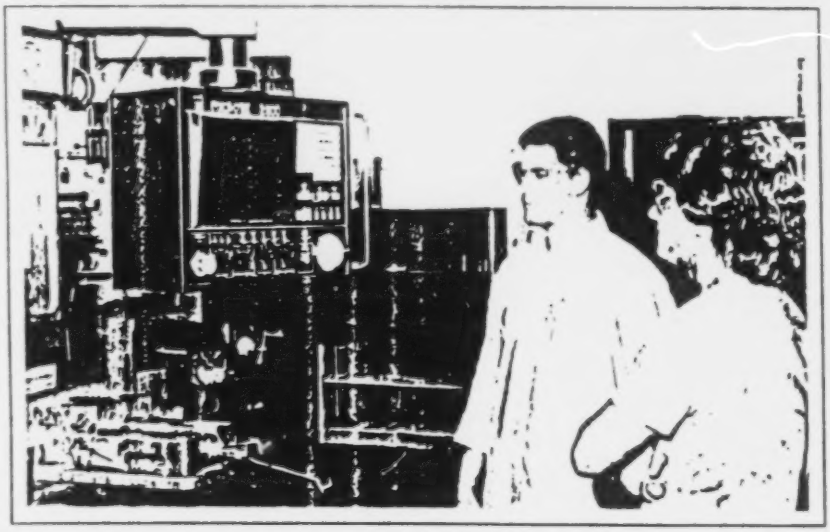
"Workers need to be highly trainable because the equipment changes so rapidly. Not only do they have to have manual skills, they must also have strong academic skills," said Helmandollar.

Many of today's workers are asked by their employers to learn new skills at workshops, equipment seminars, and trade school refresher courses. Strong skills are needed not only in math but also science and communications.

"The traditional vocational student in the past has been a non-academic student," said Helmandollar. "But now we are seeing that to operate a machine a student has to learn trigonometry, advanced computer skills, even parliamentary procedure for new team mgt. ... It's a whole new type of student that we are developing."

Ingersoll-Rand Roanoke Assist in Area 2+2 Program for Automated Manufacturing Technology

By. C A. Marshall
Representing Ingersoll-Rand on Roanoke County Schools
Vocational Education General Advisory Council



Arnold R. Burton Vocational Technical School students Chuck Pruett (left) and B.Q. Hall look over the CNC machine tool that is a part of the schools' machine shop equipment. Instruction in the use of these computer driven machine tools is the result of a growing need for computer literate machinists by companies such as Ingersoll-Rand.

Photo by Richard O. Cundiff

The general objective of the Roanoke Area 2+2 Program in Automated Manufacturing Technology is to plan, develop and implement a 2+2 program in automated manufacturing technology with local school systems. This program will encompass Virginia Western Community College, Roanoke County Schools, Roanoke City Schools, Botetourt County Schools and Salem City Schools. Local business and industries providing representatives include Ingersoll-Rand, Medeco, Norfolk-Southern, Gardner-Denver, General Electric, Roanoke Electric Steel and others.

Rapidly advancing computer assisted drafting and machine tools have created a need for trained machinists who are computer literate and capable of adapting to the ever changing technology in both the machining domain and in computer hardware and software. To operate within the complexities of this domain students must be equipped with a broad base of technical skills, math skills and computer skills as well as instruction in the principles that govern technology.

Area industries have cooperated with local schools to provide information regarding skills needed by future workers in these fields. As a result of this cooperation new curriculums are being developed to meet the specific needs of Roanoke area industries.

Dick Francis, representing Ingersoll-Rand on Botetourt County Schools' advisory council, and I attended a two day work shop using the Dacum procedure to establish a base for the curriculum to be used at the high school and community college level.

The program will result in the development of curriculums for two years of vocational training at the high school level plus two years of training at the community college level. The graduate will be trained to operate computer aided drafting equipment, computer aided manufacturing equipment and computer integrated manufacturing equipment.

These foundations for future course studies will ensure flexibility and adaptability to the ever-changing world of technology. Future machinists will be better prepared to make contributions to a technological work environment.

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VIRGINIA
INDUSTRIAL DEVELOPMENTS
DEPARTMENT OF ECONOMIC DEVELOPMENT

July 14, 1989

Contact: Lou Ann Ladin
Manager, Public Relations
(804) 371-8244

MEDIA ADVISORY
COOPER INDUSTRIES TO AWARD GRANT TO VOCATIONAL TECHNICAL SCHOOL

The Gardner-Denver Mining and Construction Division of Cooper Industries of Roanoke will present a $10,000 check to the Arnold R. Burton Vocational Technical School on Tuesday, July 18 as part of its Project PACE (Partnership to Aid Career Education).

The ceremony will be held at the school from 8:40-9:10 a.m. Mr. Kenneth Stevenson, president of Gardner-Denver, will present the check to Dr. Bayes E. Wilson, superintendent of Roanoke County Schools. A letter of recognition from Governor Gerald L. Baliles to Cooper Industries will be read.

Project PACE provides cash contributions to vocational-technical schools in ten communities across the country where Cooper has manufacturing facilities. It has been widely acclaimed as an exemplary partnership between industry and education that helps provide well-prepared workers for the jobs of tomorrow.

100

Vocational 2 + 2 could last a lifetime

National Vocational Education Week is over but the effects could last a lifetime for Salem-area students.

Beyond the school banners, a special dinner meeting at Arnold R. Burton School and other festivities, what began was a program called the Roanoke Area 2+2 Project in Automated Manufacturing Technology.

Despite its long name, 2+2 is a basic program offering students two years of vocational training in high school and another two at the college level.

The plan covers the schools of the cities of Salem and Roanoke, as well as the counties of Roanoke and Botetourt. On the higher education level, it matches with Virginia Western Community College and Virginia Tech.

The 2+2 concept is supported by a number of local businesses and indsutries, including Ingersoll-Rand, Medeco, Norfolk Southern, Gardner-Denver, General Electric, Roanoke Electric Steel and others.

Graduates of the program would be trained to operate computer-aided drafting equipment, computer-aided manufacturing equipment and computer-integrated manu-

2+2

(Continued from Page 1)

facturing equipment.

Area industries are cooperating with the schools to provide information regarding skills needed by workers in their field. Thus, the combined curriculum is being developed to meet the specific needs of the future employer.

The program got underway last week with a kickoff dinner at Arnold Burton. Leaders from all the facets involved attended.

Leaders of the 2+2 program are Ben Helmandollar, project director for Arnold Burton; Garland Kidd, director of Vocational Education for Roanoke County Schools; Monty Johnson, principal of Arnold Burton; and Wayne Michie, chairman of the Division of Engineering at VWCC.

VIRGINIA

Industry, schools to start technical skills program

By FRAN ARRINGTON
STAFF WRITER

Several Roanoke Valley businesses have joined forces with area colleges and schools to start an educational program that aims to teach vocational students technical skills now in demand in the valley.

Officials at Arnold R. Burton Technical School plan to introduce the new "2+2" Project in Automated Manufacturing Technology for representatives of industry, government and education at a 6:30 dinner meeting at the Salem school tonight.

Ben Helmandollar, director of the project, said tonight's meeting will give him the chance to explain how the project will work and how industry can help it.

According to Helmandollar, students who participate in the project begin in high school and take two years of special academic and vocational courses. They later move on to vocational programs at the community college level for two more years.

Ideally, the student who completes all four years in a certain field — such as welding or drafting — is ready to operate and program computerized machinery associated with their field.

Helmandollar said many local industries have reduced labor costs by gradually switching from manual labor to computerized machinery. The problem that valley businesses face, he said, is that there are few technical workers trained to operate the computers.

Dick Francis, manager of quality assurance for Ingersoll-Rand, which manufactures machinery, said his company is facing such a problem as it moves over to more complicated equipment.

"Right now, we're having to train people from scratch. We're spending a lot of time and money training individuals to bring them up to time and speed," Francis said.

"It would be highly beneficial to industry to have some qualified people to draw from."

Michael Westover, director of employee relations at Gardner Denver Mining & Construction, also finds it difficult to get qualified help. He said his company would give special consideration to graduates of the new program.

"I certainly think the background they pick up in the program will give them an advantage in the job market," Westover said.

"We'd look favorably on someone who has shown the dedication and discipline it would take to complete such a program."

Besides Burton, others agreeing to participate in the program are Roanoke, Roanoke County, Salem and Botetourt County school systems. Virginia Western Community College and Virginia Tech also will be involved.

Among the businesses that have agreed to help with the program are Ingersoll-Rand, Medeco Lock, Norfolk Southern Corp., Gardner-Denver Mining & Construction, General Electric and Roanoke Electric Steel.

Helmandollar said he will ask business leaders tonight to later send representatives to the colleges and schools to help with the actual designing of the project curriculum.

Thus, he said, industry will play a dual role in establishing "2+2" — first, to help write the courses students need to take and second to hire students who complete the program.

"Basically, we're asking industry what are your projected needs and how can we train students to meet those needs?" Helmandollar said.

"The whole rationale is that if these are your needs and we train them [students] to meet them, you'll likely hire them when the jobs become available."

Funding for the program comes from the Virginia Department of Vocational Education, which has committed a $40,000 grant each year for two years to its implementation, Helmandollar said.

2+2 kickoff February 15

The Roanoke Area 2-2, Automated Manufacturing Technology kick-off dinner will be held Wednesday, Feb. 15 at 6:30 p.m. at Arnold R. Burton Technical School, 1760 Boulevard, Salem.

The dinner is being held to celebrate valley cooperation of business, industry, government and education during National Vocational Education Week.

The event will be attended by local government officials, school board members, chief executive officers of cooperating businesses and industries, representatives from Virginia Western Community College and Virginia Tech and state education officials.

Roanoke County, Roanoke City, Salem City and Botetourt County schools, along with VWCC, Virginia Tech, and local businesses and industries are involved in the Roanoke Area 2-2 Project in Automated Manufacturing Technology. Businesses and industries involved include Ingersoll-Rand, Medco, Norfolk Southern, Gardner-Denver, General Electric and Roanoke Electric Steel.

The 2+2 program is two years of vocational training at the high school level plus two years of training at the community college level. The graduate will be trained to operate computer aided drafting equipment, computer aided manufacturing equipment and computer integrated manufacturing equipment.

Area industries are cooperating with the schools to provide information regarding skills needed by workers in this field. This new combined curriculum is being developed to meet the specific needs of the area through using the input of industry in the developmental phase.

voc·ed VOICE

"Hands On, Head First, Into the Future"

Roanoke program targets automated manufacturing

When the Automated Manufacturing Technology program in Roanoke County is established, it will break new ground for many areas of Virginia's vocational education.

The program is a joint effort of six public schools, Virginia Western Community College and Arnold R. Burton Vocational Technical Center. It is one of the new "2 + 2" programs in the works and the discipline of Automated Manufacturing Technology also provides skill development in a new field.

"Industry is going to automation and is having to train its own technicians," explains Ben Helmandollar, Project Director and Assistant Principal at Burton. "The program is designed to fill a void that exists between engineers and the craftspeople who work on manual equipment. There's a critical need for technicians to fill the gap and make the transition between the two levels. Industry needs people who will be able to set up and maintain these machines."

The Automated Manufacturing Technology program will combine two years of high school training in vocational programs such as drafting, electronics, machine shop or welding with two more years of advanced training at the community college level. The program is one of 13 funded articulation "2 + 2" projects.

Helmandollar says the program is receiving strong support from local industries. Cooper Industries, a Roanoke manufacturing firm, recently gave the program a $10,000 grant, while others including Norfolk Southern, International Telephone and Telegraph and General Electric have given support and cooperation in the development of the curriculum.

Helmandollar says industry enthusiasm will help the program attract the caliber of students who will succeed. "Automated manufacturing is creating a whole new type of worker; one who is highly trained and highly skilled which means we need students with strong academics," says Helmandollar. "We're looking for a whole new breed of student. We need to recruit the traditional college-bound student. That's what industry people tell us is needed."

Once implemented, the program should produce its first graduates in 1994.

"2 + 2" programs add up

Students and administrators alike are finding that "2 + 2" programs can add up when it comes to producing skilled workers.

The "2 + 2" program is one form of articulation, combining secondary and post-secondary programs to provide high-quality, low-cost vocational education. The goal of articulation, including "2 + 2" programs, is to produce highly skilled workers who can meet the technologically sophisticated requirements of industry with decreased cost to taxpayers.

Virginia currently has three established "2 + 2" programs and 10 in development. The programs vary from practical nursing and printing to engineering design and law enforcement. Business and industry representation is crucial to the programs, as are aggressive marketing and public relations.

Students benefit from the exposure to business and industry, the time-saving streamlined educational programs and a combination of hands-on training and theoretical background while gaining exposure to broader career choices and flexibility.

Published in October, February and May by the Virginia Department of Education for Vocational and Adult Education in Virginia.

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Typography: Typecraft

Address communications, inquiries, opinions and mailing requests to Jerry M. Hicks, Administrative Director, Vocational and Adult Education, P.O. Box 6Q, Richmond, VA 23216-2060.

Upcoming Events:

- **October 4-6**—Annual Conference for Local Administrators of Vocational Education, Virginia Beach, Radisson, Virginia Beach, VA
- **October 6-8**—Virginia Vocational Association and American Vocational Association Region II Meeting, Norfolk, VA
- **October 21**—Technology Student Association Fall Leadership Conference, James Madison University, Harrisonburg, VA
- **October 26-28**—Southern Business Education Association Convention, Charleston, WV
- **November 8-11**—National Future Farmers of America Convention
- **November 10-12**—Future Business Leaders of America/Phi Beta Lambda Southern Regional Fall Leadership Conference, Charlotte, NC
- **December 1-5**—American Vocational Association Convention, Orlando, FL
- **December 12-13**—Technology Education Supervisors Workshop, Richmond, VA
- **February 1-3**—State Young Homemakers of Virginia/Young Farmers of Virginia Convention
- **February 11-17**—Vocational Education Week

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PRESS RELEASE

On Tuesday, July 18, Gardner-Denver Division of Cooper Industries, located in the Roanoke Valley, presented $10,000 to Arnold R. Burton Vocational-Technical School to be used in the Roanoke Area 2 + 2 Project in Automated Manufacturing Technology.

The money was donated through Cooper Industry's Project PACE which is a national initiative to promote vocational education through providing cash contributions to vocational technical schools in ten localities throughout the United States. The grant is renewable for three years and at the end of each year the participating schools compete for an additional $25,000 based on how the money was used. Ken Stevenson, President of Gardner-Denver Division of Cooper Industries, presented the check to Dr. Bayes Wilson, Superintendent of Roanoke County Schools, who accepted the money on behalf of Roanoke County Schools, Roanoke City Schools, Salem City Schools, Botetourt County Schools, Craig County Schools, Franklin County Schools and Va. Western Community College who are all participating in the 2 + 2 project.

The Roanoke Area 2 + 2 Project in Automated Manufacturing Technology is currently being developed as a cooperative effort of education and industry in the valley to meet the needs of industry in the high tech area of automated manufacturing technology. Students enrolling in the program will take 2 years of vocational training at the secondary school level along with high academic training plus two years of advanced technical training at Virginia Western. Students graduating from the program should be able to operate the sophistocated automated manufacturing equipment that so many industries throughout the valley are going to.

A presentation breakfast ceremony agenda and guest list is included. The program featured a letter from the Governor and remarks by representatives from economic development, industry, and education.

For further information and/or information concerning upcoming activities concerning 2 + 2 and PACE contact:

Ben Helmandollar, Director
Roanoke Area 2 + 2 Project
Arnold R. Burton Vocational-Technical School
1760 Boulevard
Salem, VA 24153

SPEAKERS BUREAU

Education committee promotes new degree program

Technical training plus academic preparation equals a winning combination for Roanoke Valley students and employers. The chamber's education committee is working to promote this innovative four-year degree program known as 2 plus 2 — two years of high school followed by two years of advanced technical training. A result of cooperation among business, industry, government and education, the program is designed to meet the area's employment needs of the future.

Committee members are working with area high schools to promote the program both within the schools and within the business community through speaking engagements, primarily. The committee also is assisting in the planning and development of the program curriculum.

The first 2 plus 2 program is expected to begin in 1991.

A+ FOR THE VALLEY

In addition to the active speakers bureau list shown, the Roanoke Valley Chamber of Commerce adopted 2+2 as a speakers project for 1990.

SPEAKER'S BUREAU ACTIVE LIST

Robert L. Crouch, Owner
Price Filler Machine & Manufacturing Co.
508 Rorer Ave., S>W.
Roanoke, Virginia 24016
(Responded 12-8-89)

John Holland, President
Cybermation, Inc.
5457 Jae Valley Rd.
Roanoke, Va. 24014
(Secretary called for info.)

Don Osborne
General Electric
1501 Roanoke Boulevard
Salem, Virginia 24153
(Mr. Osborne called 1-9-90)

Robert Martinet
FiberCom, Inc.
P.O. Box 11966
Roanoke, VA. 24022-1966
703-342-6700
(Jay Muscatello and Jack Pilcher were also listed)

Steve Standifer
Singer Furniture
3322 Hollins Rd.
P.O. Box 5337
Roanoke, VA. 24013
703-366-0361 Ext. 255,254,300

William C. Laub, Vice President and General Manager
Graham-White Manufacturing Co.
1242 Colorado St.
dP.O. Box 1099
Salem, Virginia 24153
387-5600

Mr. C. A. Galletti
Gardner-Denver Mining & Construction
1700 Blue Hills Dr., N.E.
Roanoke, Va. 24012
(Also listed Mr. M. A. Westover)

Mr. Edward E. West, III, President
Capco
Capital Tool & Manufacturing
2117 Industrial Dr.
P.O. Box 982
Salem, Virginia 24153
703-387-0404

Mr. Coy Renick
Vitramon, Inc.
P.O. Box 11786
Roanoke, Virginia 24022
982-6706
(Mr. William Johnson also listed)

VIDEO/PSA DEVELOPMENT

The "Report to Business" video has been useful to introduce the 2+2 program to guidance counselors, the business community, and the general public.

Included in the video is a 30-second PSA featuring Ken Stevenson, Gardner-Denver spokesperson, endorsing the project which was aired on major television stations in the area.

A student recruitment video is being planned.

4. Agree
3. Not Sure
2. Disagree
1. Strongly, Disagree

EVALUATION OF PSA TAPE

	5	4	3	2	1
1. The music is appropriate.					
2. The graphics are effective.					
3. The content is appropriate.					
4. The message is clearly conveyed.					
5. The information is appropriate for the target audience.					
6. The timing of sequences is appropriate.					
7. The Logo is clearly presented.					
8. The PSA creates interest.					
9. The PSA conveyed pertinent information.					
10. The partnership theme was expressed.					
11. The industry endorsement was effective.					

Comments:

Awards Won by the Roanoke Area 2 + 2 Project
in Automated Manufacturing Technology:

1. Cooper Industries National Project P.A.C.E. Award $10,000 annually for three years

2. Virginia Tech's Excellence in Education Award

3. Virginia Council on Vocational Education Business Partnership Regional Award

4. U.S. Department of Education Secretary's Award for Outstanding Vocational-Technical Education Programs - state nominee

5. U.S. Department of Labor Certificate of Appreciation from Secretary Dole's Project LIFT

6. 2 + 2 logo adopted for state-wide use

7. Commendation from Roanoke County Board of Supervisors

8. Featured in various trade journals, educational journals, newspapers, newscasts, and conferences

ROANOKE COUNTY TODAY

ALL-AMERICA CITY 1989

1990 NATIONAL ASSOCIATION OF COUNTIES AWARD WINNER

Roanoke County 1 Roanoke Times & World-News, Wednesday, Oct. 10, 1990

October 1990 | The Official Newsletter of Roanoke County, Virginia | Vol. 5 No. 10

2 + 2 PROGRAM RECEIVES COOPER INDUSTRIES GRANT.

Roanoke County Superintendent of Schools, Bayes Wilson, accepted 2+2 grant from Walter Callahan, President of Gardner-Denver, as Ben Helmendollar and James Dyke watch

The Roanoke Area "2+2" program has, for the second year in a row, received a $10,000 grant from the Gardner-Denver Division of Cooper Industries.

The project is a cooperative effort between business, industry, government and education. The program, scheduled to begin this fall in area vocational schools, will develop an automated manufacturing curriculum.

Walter O. Callahan, President of Gardner-Denver, presented the check to Superintendent Bayes Wilson at a recent workshop program. The Secretary of Education for the State of Virginia, James Dyke, Jr., was present for the event.

According to "2+2" Project Director Ben Helmendollar, "Gardner-Denver's support of the 2+2 project has been a tremendous boost toward preparing technicians for future needs in automated manufacturing for the Roanoke area."

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Resolution

RESOLUTION OF APPRECIATION TO
COOPER INDUSTRIES AND GARDNER-
DENVER FOR AWARD OF 2+2 $10,000
GRANT TO ROANOKE COUNTY SCHOOLS

WHEREAS, the Arnold R. Burton Technical School is receiving a three year grant of $10,000 per year from Cooper Industries for involvement in Project PACE; and

WHEREAS, Arnold R. Burton is one of only ten schools in the United States to receive this grant; and

WHEREAS, the staff and students of the school will be working with Gardner-Denver, the local subsidiary of Cooper Industries, in implementing the program; and

WHEREAS, the funds will be used for the Roanoke Regional 2 + 2 project, which trains students from the Counties of Roanoke, Craig and Botetourt and from the Cities of Roanoke and Salem in automated manufacturing technology, preparing the students for careers in that area, and providing an educated workforce for the businesses in the area, thereby benefitting the community as a whole as well as the Roanoke County School system.

NOW, THEREFORE, BE IT RESOLVED that the Roanoke County Board of Supervisors, on behalf of itself, and the citizens and business community of Roanoke County, does hereby extend its appreciation to Cooper Industries and Gardner-Denver for their involvement in and contribution to our community.

Mary H. Allen, Clerk

Lee Garrett, Chairman

R. W. Robers, Vice-Chairman

Bob L. Johnson

Steven A. McGraw

Harry C. Nickens

Virginia Council on Vocational Education

7420-A Whitepine Road • Richmond, Virginia 23237 • (804) 275-6218

N E W S R E L E A S E

FOR JUNE 21, 1990 RELEASE

FOR MORE INFORMATION CONTACT:
Mr. George S. Orr, Jr.
7420-A Whitepine Road
Richmond, VA 23237
Phone: 804-275-6218

GARDNER-DENVER RECOGNIZED FOR PARTNERSHIP

The Gardner-Denver Division of Cooper Industries received state level recognition for its efforts with the the School Divisions of Roanoke County, Botetourt County, Roanoke City, Salem City and Craig County to assist in the improvement and strengthening of high school vocational education in automated manufacturing technology. Ann Y. Gregory, chair of the Virginia Council on Vocational Education, made the presentation to Mr. Charles G. Galletti, Director, Operations, during an awards program in Richmond honoring contributions to excellence in vocational-technical education.

The partnership was initiated by the company with the five school divisions to provide discretionary funding to help improve and strengthen vocational education for high school students in automated manufacturing technology. The Roanoke area 2+2 project was selected to receive a $10,000 per year grant renewable for three years with the opportunity to compete for $25,000 at the end of each year.

Funds are used for curriculum enrichment and technology, student incentives, or public outreach. The company has also participated in the secondary curriculum development and public relations phases of the 2+2 program.

The Virginia Council on Vocational Education is established through federal vocational legislation. Its members, drawn from a cross section of business, industry, labor, and the public are appointed by the Governor.

Council activities support the general purpose of the law, which is to "assist the States to expand, improve, modernize, and develop quality vocational education programs in order to meet the needs of the Nation's existing and future work force for marketable skills and to improve productivity and promote economic growth..."

###

CERTIFICATE OF RECOGNITION

Presented to

GARDNER-DENVER DIVISION
OF COOPER INDUSTRIES

for contributions to vocational and technical education through an exemplary business/education partnership with the School Divisions of Roanoke County, Botetourt County, Roanoke City, Salem City, and Craig County

Division Superintendent

CHECK EXCELLENCE FOR VOCATIONAL EDUCATION IN VIRGINIA 1990

Vocational Education Administrator

BUSINESS AND INDUSTRY PARTNERSHIPS
WITH VOCATIONAL EDUCATION IN VIRGINIA
SCHOOL DIVISION OR
JOINT VOCATIONAL CENTER NOMINATION

Nominee: Gardner-Denver Division of Cooper Industries
(Name of business or industry as it should appear on the award certificate)

Nominated by: The School Divisions of Roanoke County, Botetourt County, Roanoke City, Salem City, and Craig County
(School Division or Joint Vocational Center)

School Contact Person: Mr. Ben Helmandollar, Assistant Principal
(Name and Title)

Arnold R. Burton Technology Center, 1760 Boulevard, Salem, Virginia 24153
(Address) (City/Town) (Zip)

(703) 344-4643 or (703) 342-6084
(Telephone Number)

PURPOSE (Why was the partnership established?)

The partnership was initiated by Cooper Industries with the five school divisions to provide discretionary funding to help improve and strengthen vocational education for high school students specifically in the area of automated manufacturing technology.

DESCRIPTION (What is involved?)

As part of a nationwide project PACE (Partnership to Aid Career Education) the Gardner-Denver Division of Cooper Industries selected the Roanoke Area 2 + 2 Project in Automated Manufacturing Technology to receive a $10,000 per year grant renewable for three years with the opportunity to compete for $25,000 at the end of each year with nine other schools throughout Cooper's nationwide area. The funding has no conditions imposed other than it be used for curriculum enrichment and technology, student incentives, or public outreach. In addition to the funding, Gardner-Denver has participated in the curriculum development and public relations phases of the 2 + 2 program as outlined in the accomplishments section.

(Additional information requested on back of nomination form)

ACCOMPLISHMENTS (What are the results of the partnership?)

The partnership has resulted in the following activities:

1. The 2 + 2 automated manufacturing technology curriculum writing team, representing the five school divisions, toured the Gardner-Denver plant;
2. Gardner-Denver sent three corporate representatives to the curriculum writing in-service for teachers to provide updated information about the industry;
3. Gardner-Denver sent corporate representatives to the 2 + 2 project's two-day DACUM (Developing A Curriculum) procedure to provide updated information on job duties and tasks in the area of automated manufacturing technology;
4. Gardner-Denver provides corporate representatives on the 2 + 2 project's public relations committee;
5. Mr. Ken Stevenson, Chief Executive Officer of Gardner-Denver, has been and continues to be a spokesman for vocational education and the 2 + 2 program on several local newscasts and serves as a presenter to various community service organizations; and
6. The 1989-90 discretionary funding has been applied to automated manufacturing technology curriculum development and to the enhancement of the high school student recruitment phase of the 2 + 2 program.

As a result, a distinctively innovative curriculum has been written and validated by industry; a multi-facet public relations campaign has been initiated focusing on strong academic preparation with technical skills training; a dynamic business, industry, education partnership has been formed; and the overall visibility of vocational education programs in the area has been enhanced.

IMPORTANCE (How is the vocational education program strengthened? How is the local labor market served? What are the direct benefits to the business or industry participating in the partnership?)

Through the support of Gardner-Denver both with financial and human resources, the community at large is rapidly becoming aware of the critical need for highly skilled technicians in the area of automated manufacturing. At the same time, the community is realizing that an integration of specialized vocational skills training with challenging academic preparation can produce that highly trained technician needed in the workplace 2000. The corporate input provided significant impetus throughout the curriculum writing phase which has insured a curriculum tailored to the area's industrial needs. Furthermore, high school students with capabilities to adapt to and be successful in a technological work force will be recruited into the vocational areas via a marketing approach targeting a "new breed" of students. The project has stimulated increased communications within the educational environment--students, teachers, guidance counselors, administrators, parents--and between the worlds of industry and school! This partnership is a new venture for Gardner-Denver and the school divisions. All project participants anticipate it will be a viable model for many others to implement.

Nomination forms must be received in the council office by March 30, 1990. Send to the Virginia Council on Vocational Education, 7420-A Whitepine Road, Richmond, VA 23237.

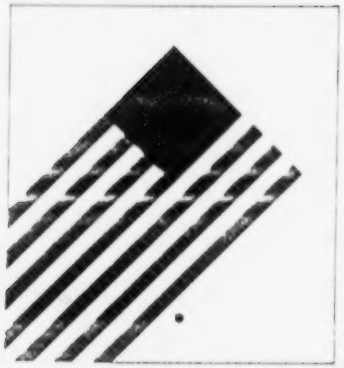
The United States Department of Labor

Certificate of Appreciation

to

Roanoke Area 2+2 Partnership

In Recognition of Participation in the 1990
LIFT *America Award Program:*
Labor Investing For Tomorrow



Elizabeth Dole
Secretary of Labor

College of Education
Office of the Dean

VIRGINIA TECH
VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

Blacksburg, Virginia 24061

October 10, 1990

Mr. Ben Helmandollar
Arnold R. Burton Technology Center
1760 Boulevard
Salem, VA 24153

Dear Mr. Helmandollar:

Award selections have been made for the Seventh Annual Excellence in Education Conference, November 8-9, at Virginia Tech. Of 179 proposals received, 18 were selected as award winners and these will be presented at the conference. An additional 34 proposals were selected to receive framed Certificates of Recognition at the conference luncheon awards ceremony on the 9th.

Your program was selected to receive a Certificate of Recognition to call attention to its quality and significant contribution to education in Virginia. In order to share your program with others, a 3'x4' area will be available for you to exhibit a self-contained display. This optionally-manned area will be open for set-up and review by participants the evening of November 8 beginning at 6:00 p.m., as well as from 8:00 a.m. continuing until the luncheon begins on Friday the 9th. In addition, the framed certificate mentioned above will be presented at the conference luncheon.

If you are unable to attend the conference, we will mail the certificate to you after the 9th. Also after the conference, we will prepare a document with abstracts of all recognized proposals and send copies to all those who sent a proposal for review. To give us some idea of how many recipients of certificates will be attending and exhibiting at the conference, please indicate your plans and return a copy of this letter to us, in addition to registering with the Donaldson Brown Center. A registration brochure is enclosed for your convenience.

We hope you and others from your school will be with us to share your award-winning ideas, as well as to support and learn about other exemplary programs in Virginia schools and to receive your certificate.

Congratulations for being recognized by the Review Committee and thank you for your participation in this significant event for Virginia education.

Sincerely,

James J. Buffer Jr.

James J. Buffer, Jr.
Dean

We are ✓ are not ___ planning on bringing information to exhibit .

We will ✓ will not ___ be able to attend the conference to receive our certificate.

The Virginia Link

A Report on Initiatives to Link Secondary and Postsecondary Programs

Fall 1990

VIRGINIA ANNOUNCES NEW "2+2" PROJECTS

The Virginia Department of Education has announced funding for five new "2+2" projects and one new "2+2+2" project. A one-year extension also was given to two existing grants, enabling them to add a third level of articulation.

The following new projects and project directors begin work in the fall of 1990:

Projects	Directors	Participants
Hotel/Motel Marketing (2+2+2)	Thomas E. Richardson	**Williamsburg-James City County; Thomas Nelson Community College; Norfolk State University
Child Care Services (2+2)	Anne Hueston Martha Green	Richmond City; Counties of **Henrico and Hanover; J. Sargeant Reynolds Community College
Early Childhood Development (2+2)	Julia Akers	Roanoke City; Counties of **Roanoke, Botetourt, Craig, and Franklin; Virginia Western Community College
Master Office Systems Technologist (2+2)	J. Dennis Hart	City of Galax, Counties of Wythe, Carroll, Smyth, Grayson, and Bland; **Wytheville Community College
Respiratory Therapy (2+2)	Don O'Donohue Judy Vipperman	City of Richmond; Counties of Henrico and Chesterfield; **J. Sargeant Reynolds Community College
Corrections (2+2)	Dr. Al Yoder	Counties of Buckingham and Cumberland; **Southside Virginia Community College
*Automated Manufacuring (2+2+2)	Ben Helmandollar	Cities of Roanoke and Salem; Counties of Roanoke and Botetourt; **Virginia Western Community College
*Practical Nursing (2+2+2)	JoAnn Lowdon	D. J. Howard Technical Center; Valley Vo-Tech Center; Massanutten Technical Center; **Blue Ridge Community College

*Existing grants and project directors funded for additional development
**Grant recipients

New project directors attended an orientation session designed to provide guidance and assistance in conducting the projects on September 28 at the Virginia Vocational Curriculum and Resource Center. Doris Wimmer, Assistant Vocational Director of Hampton City Schools, and representatives of the Virginia Department of Education conducted the session.

BEST COPY AVAILABLE

JULIA AKERS: MODEL WRITING TEAM COORDINATOR

No role in the "2+2" process is more demanding than that of writing team coordinator. This person must coordinate the work of educational and industry experts both on and off the writing team. The coordinator writes, rewrites, and edits the curriculum document required as a grant deliverable by the Virginia Department of Education.

No one in Virginia has worked harder at this role than Julia Akers, coordinator of the "2+2" automated manufacturing writing team and English teacher at Arnold R. Burton Vocational Technical Center in Salem.

Selection Criteria

The Roanoke project chose Julia as writing team coordinator for several reasons: her demonstrated facility with language; her distinguished record of service in the Roanoke area; her commitment to vocational education and to the local "2+2" project; her willingness to work; her courage in undertaking an enormous project in a field totally alien to her; and, perhaps as important as anything else, her unfailing sense of humor.

In an effort to help writing teams in other localities, *The Virginia Link* recently interviewed Julia concerning her work as team coordinator. One of the most difficult parts of her job, says Julia, lay in initial decision making. Overwhelmed by the enormity of the DACUM results and uncertainty about which precise occupations and competencies were encompassed by automated manufacturing, the team spent some time spinning its wheels. However, says Akers, "once we zeroed in on machine shop, computer literacy, supervisory and leadership skills, and oral and written communication, we were able to tap into each member's area of expertise."

Coordination Problems

Coordinating meetings posed another continuing problem. In selecting its writing team, the Roanoke project followed the old adage, "If you want something done, find a busy person." Thus, getting a whole team of "busy persons" together at periodic intervals required the most careful planning and coordination.

Simply managing so much written material was another headache, says Akers. And once Virginians see the completed task analyses, now in its final stages of preparation, just how much material the team has to deal with will be more than evident.

Common Goal

For all its difficulties, however, the role of writing team coordinator had its corresponding rewards. The experience of working toward a common goal with cooperative and dedicated experts from business, industry, and virtually every educational agency in the Roanoke Valley gave Akers her greatest sense of accomplishment. "We really became a team," she says.

Selection of an English teacher as writing team coordinator for the project activated a basic principle of "2+2--combining academic and vocational personnel in all project phases. When asked what she thought were the benefits of having an English teacher who knew nothing at all about the technical field as writing coordinator, Julia responded with

(Continued on page 5)

STATE ADOPTS ROANOKE'S "2+2" LOGO

The Virginia Articulation Task Force has adopted the logo of Roanoke's automated manufacturing project as the official state logo of "2+2" programs.

The logo, pictured at right, will be used on state publications. Localities may also use the logo for local "2+2" projects and then supply their own caption comparable to Roanoke's very effective "A+ for the Valley."

Development and production of Roanoke's logo provides yet another example of effective collaboration, a fundamental component of "2+2" philosophy. Cathy Layman, former illustrator at Virginia Western Community College, and now an art teacher at Arnold R. Burton Technical center, designed the logo. Ed Dolinger, currently artist-in-residence with the Roanoke County Schools, provided the artistic rendering. The logo was then transformed into a mobile-like sculpture by Burton fabrication/welding teacher Lynn Carroll. The result is an impressive marriage of art and technology.

Julia Akers and Ben Helmandollar pose with logo.

(Continued from page 2)
characteristic intelligence and charm: "Writing is 'second nature' to English teachers, so editing, proofing and revision were second nature to me. I'm sure also that our machine shop specialists enjoyed having a totally non-mechanical person leading the team. The situation brought some real humor to our meetings."

Good Advice

Julia offers the following advice to her counterparts in other "2+2" projects:

- Keep a sense of humor and positive attitude—everything will come together.
- Call on other people to help—do not be shy in asking.
- Use personnel from the state department, local business and industry, and subject area specialists from secondary and postsecondary institutions.
- Rely on the collective wisdom and decisions of the core writing team members.

Finally, Julia insists the writing team coordinator should invest in the largest three ring binder obtainable so that all writing material ("everything!") can be kept in one place.

Writer to Director

Hard work may be its own reward, but, in the case of Julia Akers, her efforts on behalf of "2+2" in the Roanoke area have brought additional rewards. She will soon be moving from her role of writing team coordinator for the automated manufacturing project to project director of the newly funded "2+2" in early childhood development. Julia Akers has become a major figure in Virginia's "2+2" initiative—and deservedly so.

Vocational and Adult Education
Department of Education
Post Office Box 6Q
Richmond, Virginia 23219

COOPER INDUSTRIES GIVES $10,000 TO ROANOKE VALLEY "2+2"

As the Virginia Secretary of Education, area school superintendents, and Roanoke Valley business and industrial leaders looked on, Walter D. Callahan, president of the Gardner-Denver Division of Cooper Industries, presented Ben Helmandollar, project director, a check for $10,000 to support the continuing activities of the automated manufacturing "2+2" project. This year's award marks the second consecutive year that Cooper Industries has given $10,000 to the project. In addition to the grant, Gardner-Denver has nominated the Roanoke project for the Cooper Industries national award of $25,000. Approximately 90 people attended the award ceremony and luncheon, held on July 23 at Virginia Western Community College.

The Cooper Industries award is part of the company's national Project PACE (Partnerships to Aid Career Education), designed to provide discretionary funding to pilot programs that improve vocational education for secondary students.

The keynote speaker at the award presentation was Virginia Secretary of Education James W. Dyke, Jr. Dyke praised the Roanoke "2+2" project as a potential model for the nation and urged more such partnerships between business/industry and education. Dyke termed education a "shared responsibility" and pointed out several challenges now facing occupational education, including the following:

- Reducing dropouts
- Sharing resources
- Building a stronger academic and vocational core curriculum that includes more mathematics, science, and computer competencies.
- Developing a global perspective in all areas of education.
- Providing a framework for business and industry that shows them how to participate directly in educational improvement.

The awards presentation was held in conjunction with a two-day curriculum writing workshop focusing on principles of competency assignment, course infusion, and course design. Following a curriculum writing update by Julia Akers, writing team supervisor for Roanoke's automated manufacturing "2+2", Doris Wimmer, Assistant Director of Vocational Education in the Hampton Public Schools and "2+2" veteran, conducted the opening session of the workshop.

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Peggy L. Watson, Project Director

Evaluation Plan for Roanoke County Public Schools' Automated Manufacturing Technology 2 + 2 Program

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PREFACE

The evaluators have studied the project methodology for the implementation of the 2 + 2 Program in Automated Manufacturing Technology for the Roanoke County Public Schools in Virginia. We conclude that the project's basic implementation goals are soundly in place. These goals are: project administration; development of curriculum; public relations strategy; and, coordination and involvement of business, industry, state and local school officials, secondary and community college teachers, and local citizenry in the project's planning process. In order to increase the probability of a high quality vocational program and its continued improvement, we recommend utilization of the evaluation instruments along with the instrument guideline included in this plan. We commend the effort demonstrated by those dedicated to this project, and recommend their continued involvement. In this manner these same individuals can assist with the evaluation of the actual student induction process in the Fall of 1991 and the first anticipated student graduates in the Spring of 1994.

Normally, most evaluations consist of examining the processes of a finished product. This evaluation is unique in that the evaluators were challenged with the task of developing a dynamic evaluation plan, conceived in the present to evaluate the products of the future. Our ambition is for this document to meet that challenge.

I. INTRODUCTION

This evaluation plan is a guide to evaluate the Roanoke area's 2 + 2 Automated Manufacturing Technology program. This program encompasses Virginia Western community College, Roanoke County Schools, Roanoke City Schools, Botetourt County Schools, and Salem City Schools in an articulation effort. A high school graduate can combine two years of secondary technical training to transfer to a community college and receive an additional two years of advanced training leading to an Associate Degree. Strong academic preparation along with manufacturing processes and manual skills are stressed at the secondary level. Computer applications in manufacturing is emphasized at the community college level. Students may enter and exit this program at various levels of training with the option to continue on to a four year degree.

This plan will focuses on the preparation of a comprehensive evaluation guide using an adapted evaluation model of Lucas, Miles, and Weber (1973) which is explained in detail in a later section.

II. RATIONALE FOR EVALUATING THE PROGRAM

A. The Need for the Evaluation

This evaluation was conducted in accordance with Virginia Polytechnic Institute & State University's Proposal No.: 90-1890-05; and, Titled: Evaluation of the "2 + 2 Program in Automated Manufacturing Technology" effective dates of May 16, 1990, through November 10, 1990. The evaluation plan is designed to aid program administrators in assessing the effectiveness of the Automated Manufacturing Technology Program and to the program in its endeavor to attract and educate potential skilled program graduates. The graduates upon leaving the educational setting, should be equipped with the knowledge and skills in working with computer assisted design and computer assisted machinery to match the state-of-the-art technology of the machine trade. Due to the contractual time deadlines identified in the contract, this document is designed to serve as a dynamic tool for future evaluation and program assessment.

The evaluation agreement is to be an assessment of both process and product phases of the 2 + 2 Automated Manufacturing Technology Program.

Therefore, the process phase of the evaluation will address:

(1) the goals and objectives set for the administrative procedures for curriculum development to ascertain if they are appropriate for the program;

(2) the degree to which the needs assessment inputs developed

during DACUM (Developing A Curriculum) procedure were integrated into the curriculum;

(3) and evaluate the timeline for integration to determine if it is appropriate and realistic.

The product phase of the evaluation will address and evaluate the:

(1) internal validity of the curriculum competency measures;

(2) external validity of the curriculum competency measures;

(3) internal consistency of the curriculum with current program goals;

(4) adaptability of the curriculum to other school systems, and other vocational areas;

(5) audiovisual products for readability, target population addressment, employment of basic design fundamentals, clarity, and consistency;

(6) appropriateness of the curriculum model in meeting existing goals based on current resources.

(7) In addition to the basic evaluation agreement, the product and outcomes of the potential student graduates (in 1994) to find out how they are doing in their respective capacity, and to ascertain how they perceive the program and get recommendations from them on areas for improvement,

deletion, or added to the program process for the experiences they are having on the job.

B. The General Evaluation Approach

The data collection procedures used were questionnaire, checklist, structured interviews, and observation methods.

The data collected will be analyzed using the frequency counts method. A report of evaluation findings as stated in Virginia Polytechnic Institute & State University Contract No. 90-1890-05, date inclusive, will be provided to the program director for decision making about the program.

III. THE DESCRIPTION AND OBJECTIVES OF THE PROGRAM BEING EVALUATED

A. The State of Virginia's 2 + 2 Model Philosophy

As stated in Articulation in Virginia coordination of secondary/ postsecondary education (1988), Virginia's major contribution to instructional coordination in vocational-technical education is its creation of the 2 + 2 model for comprehensive articulation. This detailed 2 + 2 plan has become a national model for excellence in program design and can be modified to meet the varied requirements of specific localities and occupations.

The 2 + 2 plan is designed to address the increasing demands of business and industry for professionally trained workers possessing the skills and flexibility required by new and emerging advanced-technology occupations. Traditionally, secondary vocational programs have prepared students for immediate employment in specific occupations. This pattern will continue in many areas for the years ahead. Increasing workforce complexities and worker requirements for advanced-technology occupations, however, necessitate more preparation than two years of secondary training alone can provide. The 2 +2 approach successfully accommodates these complex demands.

Basically, 2 + 2 programs consist of two years of secondary instruction followed by two years of postsecondary instruction, normally at a community college. Secondary training is carefully coordinated with postsecondary training to develop the complex competencies required by advanced technology and to ensure

a training continuum. In this framework students do not repeat learning activities and the two curricula do not overlap. Vital to the 2 + 2 plan is the active participation of business, industry, and government. This participation helps to ensure program quality and continuity. Representatives from these groups are involved in every aspect of the program, especially in the development and validation of program content.

B. Objectives of the 2 + 2 Program in Automated Manufacturing Technology

The following are the general and specific program objectives as stated in the project proposal abstract:

(1) General objective:

To plan, develop, implement, and evaluate a 2 + 2 program in Automated Manufacturing Technology encompassing Virginia Western Community College, Roanoke County Schools, Roanoke City Schools, Botetourt County Schools, and Salem City Schools in an articulation effort with area business and industry.

(2) Specific objectives:

(a) To open the communication and articulation link between area secondary vocational schools, the community college and the business/industrial community and, further, to develop partnerships with area LEA's, business, industry, community college and government.

(b) To select and implement a needs assessment procedure to assess the needs of area industry so that a curriculum can be tailored to produce marketable outcomes.

(c) To develop a curriculum framework and curriculum materials necessary for the program.

(d) To adopt procedures for program implementation.

(e) To develop evaluation strategies, procedures and instruments to assess the strengths and improve the weaknesses of the model.

(f) To identify in-service training needs of teachers and provide training resources.

(g) To prepare audiovisual materials for the orientation of educators, students, parents, business/industry/government and the community.

(h) To provide information to the public about the program.

The next section will discuss the methodology chosen to meet the evaluation objectives of this program.

IV. A PROGRAM OF EVALUATION

Prior to the widespread implementation of any program of instruction, major questions concerning program worth need to be answered. Education evaluation methodology is the vehicle by which decision making information addressing educational conditions is gathered and analyzed. This section explains the evaluation task to be addressed and provides an illustration showing how the guide can be used. The guide is presented in matrix format (see Evaluation Matrix Number One). This matrix depicts a systems approach to evaluation. The format provides the evaluator with a blueprint of the evaluation scheme so that one can see, in summary form, all the essential facets of the evaluation plan.

Lucas et. al. (1973) model was adapted for use in this evaluation. The design consists of two major parts, decision components and program components. Six facets make up the decision component dimension. They are shown as column headings in the matrix and include:

1. Program goals
2. Operationalized outcomes
3. Data collection format
4. Criteria
5. Judgement alternatives
6. Decision

Definitions for each of these terms are given below, and will be described in

greater detail in a section appearing later.

Program Components: Elements of an education program that are to be evaluated. Dependent upon the nature of the program, they necessarily vary for one evaluation to another. Examples of program components are administration, instruction, curriculum, economics, personnel, methodology, material, etc.

Decision Components: Elements of the evaluation guide that illustrate the format for evaluating program components. They are program goals, operationalized outcomes, data collection format, criteria, judgement alternatives, and decisions.

Program Goals: Broad statements of anticipated outcomes of an educational program. Stated in non-behavioral terminology, they are the "hoped for" results of the program. Examples are favorable attitudes, instructional effectiveness, usability, and economic feasibility.

Operationalized Outcomes: An objectively measurable statement of a program goal. The operationalized outcomes are stated in a manner such that clues are provided as to how information and evidence concerning program worth shall be gathered.

Data Collection Format: This term refers to the sources where data will be collected in an evaluation and to the instrumentation of other collection methodology that will be used for gathering it. The

format may also specify analytical techniques for data treatment and analysis.

Criterion: A standard for deciding whether or not a particular program component is of value.

Judgement Alternatives: This item refers to alternate courses of action available to those directing the evaluation if program components fail to meet the established criteria.

Decision: The judgement, favorable or unfavorable, summative or formative, about a program component.

Program components are shown as row headings on the evaluation guide. Since it is difficult to specify precisely a set of components which are applicable to all programs, the authors will suggest things that may be considered by program directors to aid in their decision making process.

Five major components have been identified as being important to the success of the program in meeting proposed goals. Administration procedures, timeline integration, curriculum development, audiovisual products, and students. These components will form the basis of the development of the evaluation guide.

It has been alluded to that it is not critical for all evaluation plans to conform to set procedures, and especially not important that program components being evaluated be the same for all programs. A consideration that is at least as vital as program components, and one that is often slighted when evaluating programs, is the conditions by which the components to be evaluated for a

program are decided. While it is beyond the scope of this report to elaborate on methods program components, it should be mentioned that the evaluation plan should be responsive to the needs of the system and meaningful and useful to those who are in charge of the program. In making the decision as to what components should be evaluated, provision for input by a variety of sources should be made. Included among them are educational administrators, teachers, students, parents, community representatives, and others.

The first of the decision components, shown as a column heading in the evaluation matrix, is that of program goals. Program goals refer to the desired outcomes of each of the program components listed in the rows of the matrix. Generally, they are broad statements reflecting, typically in laudatory fashion, the "hoped for" results of the program. Some of the terms or phrases used to depict program goals are validity, effectiveness, favorable attitude toward program, appropriate content, achievement of objectives, and the like. Stated in laymen's terminology, the program goals give guidance to the program evaluator in deciding what answers are desired by persons mandating the evaluation. From these rather nebulous statements are developed the operationalized outcomes, column heading two, of the decision components.

An operationalized outcome is a behavioral or objectively measurable statement of a program goal. The language used when listing program goals is so undeterminable that it is impossible to gather evidence, pro or con, about educational programs. Unless the goals can be stated in such a fashion that clues

are provided as to where such information may be located, the goals are of little use. For example, it may be completely reasonable to speak about program effectiveness when formulating goals. Indeed, the desire that educational programs be effective ones is shared by all. However, when an attempt to measure effectiveness problems arise because of the abstract nature of the term "effectiveness." It is only after one redefines the term that data can be gathered help make the judgement. Terms like "effectiveness" need to be operationalized into measurable language, or events, such as:

1. What percentage of the students obtain the program objectives?
2. What percentage of the students articulate into the community college programs?
3. Do program completers obtain the skills necessary to compete in the workplace?

How to redefine program goals into operational terms is a matter of choice for those responsible for developing the evaluation guide. Due to the dynamics of this particular evaluation document, it should be emphasized that the choice is not one that belongs solely to an evaluation expert. But input from program directors, students, teachers, school administrators, should be elicited.

The operationalization of goals provides clues for developing the data collection format, the third column heading of the decision component dimension. For example, in regard to the program goal, effectiveness, if we have decided that the percent of students who attain the objectives is an operational measure of that

goal, how shall we proceed to collect data that will help us reach a decision. In other words, what are the sources of data and in what format shall they be collected?

The method of data collection will depend on what is being evaluated. For example, if the concern is with the attitudes of students or teachers, a data format of a teacher or student questionnaire may be appropriate. The critical consideration is that the procedures for reporting information be accurate and efficient.

A criterion is a standard for judging the worth of a product. The establishment of valid criteria is a critical part of the evaluation design. Each of the program components, or, more properly, the operationalized outcomes, have to be scrutinized and rated as to whether it has merit. The decision is a straightforward one, once the criteria have been established, and the judgmental part of the evaluator's role is exceedingly simple, if the criterion phase has received proper attention. The critical part of this phase of evaluation is the credibility of the criteria used.

Procedures for establishing criteria are complex and will vary from one evaluation scheme to another. There are, however, certain guidelines with which those responsible for program evaluation should be familiar. Among the important points to check are:

1. Provision for input by all major parties affected by the evaluation.

2. Provision for input by the person ultimately responsible for making the decision.

3. Consideration of whether the evaluation is formative or summative in nature.

4. Consideration of the logical and empirical natures of criteria.

5. Consideration of economic feasibility.

6. Consideration of practicality.

7. Statement of criteria in operationally measurable format.

A brief discussion of the above guidelines should improve clarity. The first two points on the establishment of criteria concern input by appropriate parties and are apparent. Personnel who are involved in setting standards for their own programs are apt to accept judgement findings which result from the evaluation. This does not mean that input from outside sources is excluded. To the contrary, frequently, people outside a system are in a better position to establish criteria than those who are a part of it because of two reasons: (1) they may be more objective since they are detached from the program and have no personal involvement; or (2) they may have expertise essential to the establishment of criteria not possessed by other members of the team. When voice in the establishment of criterion by concerned individuals is allowed, some assurance is provided that important criterion considerations have not been overlooked.

The need to include the individual(s) responsible for ultimately making a decision is functional. Unless the authority figure agrees that a standard is

appropriate, the evaluator will be unable to make a decision, or any decision made may be incompatible, in which case the evaluation may provide little valuable information.

The third guideline for establishment of criteria relates to the temporal nature of the criteria, i.e., whether the criterion is one that shall be abided by temporally or permanently. Evaluation criteria that are tentative, subject to change as one moves through the evaluation process, may be called formative. Formative criteria are of a "cut and try" character. Sometimes when "logical" criteria are established they prove to be unrealistic because they lack the basis for framing the criteria. Therefore, evaluators need to alter the criteria after an initial point has been instituted. Criteria that are reasonably permanent may be referred to as summative. Such criteria are derived from a scientific and/or logical bases and are more or less unalterable. Summative criteria should be used when the purpose is to finalize decisions about an educational program and in instances where the decisions may effect their implementation.

Some of the criteria that are established will be based on logical arguments. Other criteria will be based on empirical evidence. It appears that the validity of logical criteria is less rigorous than that which is empirical in nature. Conditions under which the evaluation occurs oftentimes necessitate the use of logical criteria. Time and cost, for example, may prevent the gathering of the data needed to establish empirical criteria; to the contrary, a logical criterion may not necessarily mean a sacrifice of rigor. An example of a logical criterion might be the

evaluation of teacher attitudes toward the program's curriculum, and the criterion is established that more than half of the teachers should favor the curriculum. From a logical point of view, it may appear that more than half the teachers should favor the program's curriculum. Thus, the criterion that 50 percent of the teachers must respond with a "yes" seems appropriate. One should realize, however, that research on attitudes might show that another percentage is appropriate. If, for example, a study showed that the Hawthorne effect was a factor in the adoption of new educational methods to the extent that 80 percent of the teachers favored this method, the 80 percent figure would be more valid than the 50 percent figure. On the other hand, another study might show teachers are conservative and resistant to change and only 30 percent favored the new method. In the latter instance, a 30 percent figure would have been appropriate.

Another facet to be considered when establishing criteria is the matter of cost. If the program is massive, as was this project, the costs of having experts evaluate all items in the program are usually prohibitive. Therefore, a compromise method is used, such as sampling of items and objectives for examination by experts. In such an instance "congruence" of an operational outcome with its criteria being the approval of evaluation and subject matter experts would be most appropriate.

Considerations of practicability, other than cost, are similarly important when establishing criteria. Time factors may preclude the gathering of information with which to establish standards or certain information essential to

the establishment of criteria may not be available at the time the standard has to be established.

A final guideline for specifying criteria is that they be operationally defined so that the criteria is explicit to the evaluators. Criteria phrased in vague terminology lends itself to variable interpretations and is suspect. If, for example, a criterion for success of a 2 + 2 articulation program is "administrative approval" the evaluator does not know if this means approval by the program director, high school principal, school district administrative staff member, community college administrator, or the superintendent. All may give different judgement about the value of the program. A decision about the worth of a program may rest on who was asked.

The fifth column heading of the evaluation guide is the decision component, judgement alternatives. Judgement alternatives refer to courses of action that should be examined if established criteria are not attained. The ascertainment of what should be done in the event that a part of the program does not reach the standard is something that should not be based on a "spur of the moment" decision. Prudent evaluators look to contingencies of action in advance. Alternative possibilities must be considered when the evaluation guide is developed.

Procedures for developing judgement alternatives are similar to those used when establishing criteria. Obviously, provision for input from relevant sources needs to be made. The manner of determining alternatives may be logical or

empirical. Some alternatives can be brainstormed, others can be researched based. Depending on the criteria, alternatives may be readily apparent in given instances. For example, if an operationalized outcome is teacher attitudes toward program curriculum requires a criteria of greater than 50 percent favorable response by teachers. If the criterion is not attained, an obvious alternate course of action is that the program curriculum be revised. In other situations there may be other choices that should be considered. Another course of action may be to use the curriculum with teachers who have expressed a favorable attitude. Or, in the absence of readily workable choices, it may be necessary to abandon the program because of lack of support by the teachers and seek other training modes.

Other alternatives may involve more complex action. Suppose one of the criteria established for a program component was that of a 80 percent attainment rate. If the criterion is not reached, and if the criteria were established logically, with no research base, it may be that the 80 percent level was too high. Inversely, there are no guarantees that establishing criteria with a research methodology would result in the 80 percent level of attainment either. A cautious approach would seem wise in such an instance and a mini-evaluation of the methods under consideration might be undertaken before choosing alternative courses of action. (Mini-evaluation is a term for research undertaken to gather additional information before making decisions.)

After having weighed all the evidence, the ultimate goal of an evaluation is

to reach a proper decision. Sometimes reaching the proper decision is viewed as the most difficult part of the total evaluation, especially in instances where the decision is adverse. In instances where negative findings are reported, personnel involved in the program being evaluated sometimes are unable to accept realities. This nonacceptance is minimized when the evaluation plan is well-conceived and well-developed. Two of the most important considerations in reaching decisions are authority and finality. Authority refers to the individual or agency who has the power to make the decision. Finality refers to whether the decision is either tentative or permanent. Both of these characteristics can play havoc with educational evaluation. Efforts that can be taken to prevent or lessen the effect of such action have been mentioned in other sections. The authority problem can be circumvented by providing for input form all sources likely to be effected by the evaluation. These sources would include instructional staff, administrative staff, parents, pupils, and local, state, and federal agencies.

The finality problem is somewhat more difficult to resolve because of its relationship to the nature of evidence upon which a decision is reached. The type of data that is collected to scrutinize a particular program component is dependent on several factors. Among the important ones are the time within which the decisions have to be make, the money available for gathering the data, and the personnel and technological expertise at the disposal of those directing the project. If these types of resources are in short supply, it may be that the validity of the decision will be limited, in which case the decision may be formative

in character. If resources are plentiful and care is taken to establish sound data collection and analysis methodologies, the nature of the decision may be summative.

V. AN EVALUATION PLAN FOR ROANOKE COUNTY SCHOOLS' 2 + 2 AUTOMATED MANUFACTURING TECHNOLOGY PROGRAM

A. Constraints on Evaluation Design

There are certain constraints with the evaluation as with any other project. The 2 + 2 Automated Manufacturing Technology Project Number: VA-89-PI-IIB3-001, for Roanoke County Public Schools officially began November 15, 1988, and the evaluation proposal was approved on May 16, 1990. In addition to these obvious program entry dates is the actual student induction in commencing in the Fall of 1991 and the first anticipated student graduate in the Spring 1994, have influenced the methodology of this evaluation plan.

This evaluation is unique in that the evaluators were challenged with the task of developing dynamic instruments and guidelines to evaluate the products of the future. In order to meet the challenge, this document must be utilized, modified, and kept up-to-date by those tasked with the administration and management of this project. As evaluators, it is our ambition that this evaluation plan fulfill its primary goal of providing information so that real and objective decisions can be made to improve the end-product, a highly trained workforce for the future.

B. General Organizational Plan for the Evaluation

The initial step in designing an evaluation is the construction of an evaluation guide. The model utilized was developed by Lucas et. al. (1973) and

has been adapted for use in this evaluation. Its six decision components of program goals, operational outcomes, data collection format, criteria, judgement alternatives, and decisions were retained. They are shown as column headings in the evaluation matrix section (See Evaluation Matrix One).

An evaluation guide is the master plan showing, in summary form, the components of the program that are being evaluated, the program goals, the data collection methods, and the established criteria for specific components. It serves as the evaluation blueprint. A complete discussion of elements in the guide is presented in the program evaluation section, IV, of this report.

As per contractual agreement between the Project Director and Virginia Polytechnic Institute and State University, the process and product assessment phases of the project were to be evaluated. The process and product assessments will be categorized into five major program components. These components are administration procedures, timeline integration, curriculum development, audiovisual products, and students.

Process Evaluation

Process evaluation rates such factors as how the curriculum was developed and the use of advisory mechanisms, just to name a few. The premise is that by an evaluation of program characteristics, conclusions can be made about those characteristics (Silvius & Bohn, 1976). Therefore, the process phase of this evaluation will address:

(1) the goals/objectives set for the administrative procedures for

curriculum development to ascertain if they are appropriate for the program;

(2) whether the needs assessment inputs developed during DACUM (Developing A Curriculum) procedure were integrated into the curriculum; and,

(3) evaluate the timeline for integration to determine if it is appropriate and realistic.

Evaluation Questions on Process Evaluation

The first stage of the evaluation model (See Evaluation Matrix One) addresses the process phase of the program's development and will examine the following questions:

1. Was there a project director and a steering committee appointed to plan, implement, and evaluate the program?
2. Was there an advisory committee of representatives form business, industry, local educational agencies, and government formed to work with the project director and steering committee?
3. Was a needs assessment strategy developed?
4. Were guidelines developed for gathering needs assessment inputs?
5. Was the needs assessment strategy appropriate for this setting?
6. Were guidelines appropriate for the needs assessment process?
7. Did local business and industry representatives participate in the needs assessment process?

8. Were local educational agencies (LEA's) included in the needs assessment process?

9. Were needs assessment inputs from local business and industry integrated into the curriculum?

10. Were external resources (i.e. existing curriculums, studies, reviews of the literature) provided to the participants of the needs assessment group for guidance?

11. Was the timeline developed for the needs assessment process appropriate and realistic?

12. Was the timeline for integration for the needs assessment inputs into the curriculum appropriate and realistic?

13. Was a public relations component structured into the program?

Product Evaluation

Product evaluation attempts to measure and interpret the attainments yielded by an instructional program at its conclusion, and as often as deemed necessary during the program itself. Focus is clearly on the outcome of the approach or program (Silvius et al., 1976). Therefore, the product phase of the evaluation will address and evaluate the following:

(1) internal validity of the curriculum competency measures;

(2) external validity of the curriculum competency measures;

(3) internal consistency of the curriculum with current program goals;

(4) adaptability of the curriculum to other school systems, and other

vocational areas;

(5) audiovisual products for readability, target population addressment, employment of basic design fundamentals, clarity, and consistency;

(6) appropriateness of the curriculum model in meeting existing goals based on current resources.

(7) In addition to the basic evaluation agreement, the product and outcome of the potential student graduate (Spring 1994) will be examined. The requirement to assess the student will directly indicate the effectiveness of the training program. Some of the areas of evaluation concern are: (a) to find out how they are doing in their respective capacity, (b) to ascertain how they perceive the program and get recommendations from them on areas for improvement, deletion, or added to the program process for the experiences they are having on the job.

Evaluation Questions on Product Evaluation

This stage of the evaluation model addresses the product phase of the program's development and will examine the outcomes (See Evaluation Matrix Two). It must be noted that validation is the process of testing and revising curriculum and instruction to be certain that the instructional intent is achieved. It is a process of proving the effectiveness of the curriculum design. Therefore, validation is accomplished through conducting classes using the designed curriculum. Criterion referenced measurement items are used to determine

whether the students who received the instruction acquired the necessary skills and knowledge. Data pertaining to all aspects of the validation effort are collected and analyzed. The methods designed to collect this data include: (a) current student critiques [beginning Fall 1991]; (b) instructor personal critiques, comments, recommendations; (c) program graduates [Spring 1994]; and, (d) employers from business and industry who hire the program's graduates.

For the sake of simplicity, the product evaluation's program components will examine three major categories. Those categories are curriculum, audio-visual aids, and students.

The first category examines the curriculum and will address the following questions:

1. Do the competencies written into the curriculum exhibit the internal validity proposed for this program?
2. Does the curriculum competencies exhibit external validity of its measures in order to allow for student participation from area schools?
3. Does the curriculum maintain internal consistency with program goals?
4. Is the curriculum adaptable to other school systems and other vocational areas?
5. Is the curriculum model appropriate in meeting existing goals based on current resources?

6. Which (if any) of the curriculum components are deficient?

The second component examines the audio-visual aids which are used in context as a public relations element of this program. The major points of the audio-visual aids examination will ask the following questions:

1. Is the readability of the audio-visual aids appropriate?
2. Do the audio-visual aids address the intended target population?
3. Are basic audio-visual aid design fundamentals employed?
4. Are the audio-visual aids clear and present a consistent message?

The third component of the product evaluation is the student. The questions asked to examine the major point of the student include/s:

1. How well are the students performing?
2. To what extent are students satisfied with their instruction?
3. What is the mobility of the graduates?
4. How satisfied are former students with their present or anticipated position?
5. How do employers view the performance of program graduates?
6. Has the program benefitted the student/graduate in their present or anticipated occupational position?
7. How adequate is the curriculum preparing individuals for job entry?
8. Are the skills learned in the program utilized in performing their present job or anticipated job?
9. What percentage of the students obtain the program objectives?

10. What percentage of the students articulate into the community college program?

11. Do program completers obtain the skills necessary to compete in the workplace?

12. What percentage of the students complete program goals?

13. What percentage of the students articulate into the community college program?

Reliability of Test Instruments

The reliability of the instruments used to evaluate the program must be considered. The test instruments are an eclectic mix of various surveys, tests, questionnaires, checklists, and structured interview questions. Before a test is adopted, it should be determined whether the evaluation matrix criteria (i.e. = or > 85% favorable response) will be sufficiently reliable for the intended purposes. However, if a test is intended for program evaluation, rather than individual pupil assessment, a somewhat lower level of reliability may be tolerated. The criteria set for this evaluation is only a suggested level and should be modified to account for errors in measurement. Some suggested methods would be: estimating reliability on a single occasion; estimating reliability over a time period; and, estimating scorer reliability.

EVALUATION MATRIX ONE

PROCESS EVALUATION

EVALUATION MATRIX ONE
PROCESS EVALUATION

PROGRAM COMPONENTS	DECISION COMPONENTS					
	Program Goals	Operationalized Outcomes	Data Collection Format	Criteria	Judgement Alternatives	Decision
ADMINISTRATIVE PROCEDURES	Organization	Appointment of project director and steering committee members	Archival Records	[] Appointed [] Not-appointed	Appoint director and steering committee members	ADMINISTRATIVE PROCEDURES [] Favorable [] Non-favorable
		Advisory committee established to include members of: 1) business/industry 2) local education agencies (LEA's) 3) state and local government	Archival Records	[] Appointed [] Not-appointed	Appoint advisory committee members from a) business/industry; b) LEA's c) government	[] Formative [] Summative Comments:
	Involvement	Documented meetings/activities involving all administrative groups.	Archival Records	[] Documented [] Not-documented	1) Schedule group meetings 2) Support group activities 3) Insure involvement	

EVALUATION MATRIX ONE
PROCESS EVALUATION

PROGRAM COMPONENTS	DECISION COMPONENTS					
	Program Goals	Operationalized Outcomes	Data Collection Format	Criteria	Judgement Alternatives	Decision
ADMINISTRATIVE PROCEDURES (continued)	Public Relations	Establishment of a public relations effort	Archival Records Brochures, Videos, Newspaper Files	On-hand: [] Brochure [] Videos [] Various newspaper releases	Generate development of: 1) Brochure 2) Videos 3) Various press releases	
CURRICULUM DEVELOPMENT	Effectiveness	Program strategy development for needs assessment	Archival Records, Interviews	[] Strategy established [] No strategy	1) Appoint committee to establish strategy 2) Contract consultant to develop strategy	CURRICULUM DEVELOPMENT [] Favorable [] Non-favorable [] Formative [] Summative
		Guideline development for needs assessment input and process	Archival Records	[] Guidelines established [] No guidelines	1) Appoint committee to establish guidelines 2) Contract consultant to develop guidelines	Comments:

EVALUATION MATRIX ONE
PROCESS EVALUATION

PROGRAM COMPONENTS	DECISION COMPONENTS					
	Program Goals	Operationalized Outcomes	Data Collection Format	Criteria	Judgement Alternatives	Decision
CURRICULUM DEVELOPMENT (continued)	Content Validity	Curriculum content validity was assured by utilizing the needs assessment inputs from the following: 1) business and industry 2) local educational agencies (LEA) 3) external resources	Archival Attendance Records	[] Attended [] Did not attend [] Utilized [] Not utilized	1) Invite business and industry to participate. 2) Survey business and industry if unable to attend.	
		Needs assessment inputs were integrated into the curriculum	Curriculum	> 95% of needs assessments inputs integrated into the curriculum	1) Revise and include needs assessment inputs 2) Justify lack of needs assessment integration	

EVALUATION MATRIX ONE
PROCESS EVALUATION

PROGRAM COMPONENTS	DECISION COMPONENTS					
	Program Goals	Operationalized Outcomes	Data Collection Format	Criteria	Judgement Alternatives	Decision
TIMELINE INTEGRATION	Achievement of objective	Realistic timeline established for the following processes: 1) needs assessment inputs 2) needs assessment integration into the curriculum 3) curriculum writing process 4) program videotape productions	End Product, Archival Records	Congruence	1) Re-evaluate timetable 2) Document and justify time over-run 3) If over-runs are forecasted seek time extension from approval authority	TIMELINE INTEGRATION [] Favorable [] Non-favorable [] Formative [] Summative Comments:

EVALUATION MATRIX TWO

PRODUCT EVALUATION

EVALUATION MATRIX TWO
PRODUCT EVALUATION

PROGRAM COMPONENTS	DECISION COMPONENTS					
	Program Goals	Operationalized Outcomes	Data Collection Format	Criteria	Judgement Alternatives	Decision
CURRICULUM DEVELOPMENT	Internal Validity	Students enter employment for which they were trained	Appendix D Questions: 6, 7, 9 10, 13, 14, 15, 19. Appendix E Questions: 2, 4, 8, 9, 10, 11, 12. Appendix F Questions: 16, 17. Appendix G Questions: 8, 9.	= or > 80% favorable response	1) Conduct follow-up industry needs assessment 2) Re-write curriculum 3) Discontinue training	CURRICULUM DEVELOPMENT [] Favorable [] Non favorable [] Formative [] Summative Comments:
		Program graduates satisfy local business\industry employee needs	Appendix D Questions: 6, 7, 9, 15, 16, 19. Appendix E Questions: 2, 4, 8, 15.	= or > 95% favorable response		
	External Validity	The curriculum permits articulation between participating area high schools and the community college	Appendix A Questions: 13, 14. Appendix D Questions: 1, 2, 24, 25. Appendix F Question: 6.		1) Establish articulation agreement 2) Review curriculum 3) Discontinue training	

EVALUATION MATRIX TWO
PRODUCT EVALUATION

PROGRAM COMPONENTS	DECISION COMPONENTS					
	Program Goals	Operationalized Outcomes	Data Collection Format	Criteria	Judgement Alternatives	Decision
CURRICULUM DEVELOPMENT (continued)		Participating schools utilize the developed program curriculum	Appendix A Questions: 13, 14. Appendix D Questions: 24, 25. Appendix F Question: 18.	Congruence	1) Implement curriculum utilization policy 2) Establish incentives for curriculum utilization 3) Discontinue training program	
	Improve Program	Curriculum model meets training needs based on current resources	Appendix A Questions: 4, 5, 6, 7, 8. Appendix D Questions: 20(f), 20(g), 20(h), 20(i). Appendix F Questions: 14, 15, 17.	Congruence	1) Request additional resources from business/ industry 2) Modify curriculum 3) Request public support	

EVALUATION MATRIX TWO
PRODUCT EVALUATION

PROGRAM COMPONENTS	DECISION COMPONENTS					
	Program Goals	Operationalized Outcomes	Data Collection Format	Criteria	Judgement Alternatives	Decision
CURRICULUM DEVELOPMENT (continued)		Identification of (if any) deficient curriculum components	Appendix A Question: 16. Appendix D Questions: 18, 19, 22, 23. Appendix E Questions: 8, 9, 10, 11, 12. Appendix F Questions: 18, 19, 20, 21.	Congruence	1) Appoint curriculum review team 2) Modify/ eliminate curriculum deficiencies 3) Rewrite curriculum	
		Employer participation on advisory counsel to provide periodic review and up-dating of program	Appendix E Questions: 19, 20. Appendix F Questions: 8, 9.	= or > 90% business and industry involvement on advisory councils	1) Establish program advisory council 2) Encourage business/ industry participation 3) Recognize and publicize business/ industry contributions	

EVALUATION MATRIX TWO
PRODUCT EVALUATION

PROGRAM COMPONENTS	DECISION COMPONENTS					
	Program Goals	Operationalized Outcomes	Data Collection Format	Criteria	Judgement Alternatives	Decision
AUDIO-VISUAL AIDS	Public Relations (Brochure)	Development of program handout\brochure insuring:	Appendix B	= or > 98% favorable response	1) Re-design brochure 2) Modify brochure 3) Eliminate brochure	AUDIO-VISUAL AIDS [] Favorable [] Non-favorable [] Formative [] Summative Comments:
		1) readability	Questions: 1, 4, 6			
		2) addresses target audience	Questions: 1, 6, 10			
		3) basic design fundamentals	Questions: 1, 3, 4, 5, 7			
		4) clear and concise message	Questions: 2, 3			
		5) effective graphics	Questions: 1, 5, 8, 9			

EVALUATION MATRIX TWO
PRODUCT EVALUATION

PROGRAM COMPONENTS	DECISION COMPONENTS					
	Program Goals	Operationalized Outcomes	Data Collection Format	Criteria	Judgement Alternatives	Decision
AUDIO VISUAL AIDS (continued)	Public Relations (Video tape)	Development of student recruitment video tape insuring:	Appendix C	= or > 95% favorable response	1) Edit video 2) Re-design video 3) Delete recruitment video	
		1) appropriate content	Question: 3			
		2) effective graphics	Question: 9			
		3) clear and concise message	Questions: 1, 8, 9			
		4) appropriate music	Question: 2			
		5) appropriate sequence timing	Questions: 5, 10			
		6) addresses target audience	Question: 4			
		7) creates interest	Question: 6			
		8) conveys pertinent information	Questions: 1, 7, 8			
		9) presents continuity of content	Questions: 5, 10			

EVALUATION MATRIX TWO
PRODUCT EVALUATION

PROGRAM COMPONENTS	DECISION COMPONENTS					
	Program Goals	Operationalized Outcomes	Data Collection Format	Criteria	Judgement Alternatives	Decision
AUDIO-VISUAL AIDS (continued)		Development of student pre-enrollment video tape insuring:	Appendix C	= or > 95% favorable response	1) Edit video 2) Re-design video 3) Delete pre-enrollment video	
		1) appropriate content	Question: 3.			
		2) effective graphics	Question: 9.			
		3) clear and concise message	Questions: 1, 8, 9.			
		4) appropriate music	Question: 2.			
		5) appropriate sequence timing	Questions: 5, 10.			
		6) addresses target audience	Question: 4.			
		7) creates interest	Question: 6.			
		8) conveys pertinent information	Questions: 1, 7, 8.			
		9) presents continuity of content	Questions: 5, 10.			

EVALUATION MATRIX TWO
PRODUCT EVALUATION

PROGRAM COMPONENTS	DECISION COMPONENTS					
	Program Goals	Operationalized Outcomes	Data Collection Format	Criteria	Judgement Alternatives	Decision
STUDENT	Satisfaction	Student enters training program of choice	Appendix A Question: 10. Appendix D Questions: 3, 4, 5.	= or > 90% favorable response	1) Increase program information effort 2) Inform student guidance counselors	Student [] Favorable [] Non-favorable [] Formative [] Summative Comments:
		Students meet occupational/ vocational goals	Appendix A Question: 11. Appendix G Questions: 6, 8.	= or > 80% favorable response	1) Review curriculum 2) Review industry requirements 3) Re-evaluate program goals	
		Student perceptions of the quality of program training	Appendix A Questions: 4, 9, 12. Appendix D Question: 20(c).	= or > 90% favorable response	1) Evaluate curriculum 2) Evaluate instruction 3) Modify program 4) In-service staff training	

EVALUATION MATRIX TWO
PRODUCT EVALUATION

PROGRAM COMPONENTS	DECISION COMPONENTS					
	Program Goals	Operationalized Outcomes	Data Collection Format	Criteria	Judgement Alternatives	Decision
STUDENT (continued)		Student satisfaction in pursuit of Automated Manufacturing vocation	Appendix A Questions: 3, 9.	= or > 90% favorable response		
		Graduate continues to pursue occupation after five years	Appendix D (Graduate 5-year survey)	= or > 50% favorable response		
	Placement	Graduates placed in employment directly for which training was given	Appendix D Questions: 6, 7, 11. Appendix E Questions: 2, 4.	= or > 90% favorable response	1) Increase industry involvement 2) Evaluate training program 3) Evaluate placement services 4) Increase public relations effort	

EVALUATION MATRIX TWO
PRODUCT EVALUATION

PROGRAM COMPONENTS	DECISION COMPONENTS					
	Program Goals	Operationalized Outcomes	Data Collection Format	Criteria	Judgement Alternatives	Decision
STUDENT (continued)		Graduate placed in employment in field related to training	Appendix D Questions: 6, 7, 11. Appendix E Questions: 2, 4.	= or > 95% favorable response		
		Graduate placed in employment position having wage rates commensurate with training	Appendix D Question: 12. Appendix E Question: 7.			
	Guidance Services	Provide for guidance counseling, employment\occupational information, and student placement in Automated Manufacturing Technology program	Appendix D Questions: 17, 20(d), 20(e). Appendix F Questions: 1, 2, 3. Appendix G Question: 8.		1) Provide program information and training to school guidance personnel 2) Actively involve guidance personnel in public relations effort	
	Effectiveness	Employers are satisfied with the performance of program graduates	Appendix D Question: 21. Appendix E Questions: 8, 9, 11.		1) Evaluate training 2) Evaluate curriculum 3) Re-accomplish industry needs assessment	

EVALUATION MATRIX TWO
PRODUCT EVALUATION

PROGRAM COMPONENTS	DECISION COMPONENTS					
	Program Goals	Operationalized Outcomes	Data Collection Format	Criteria	Judgement Alternatives	Decision
STUDENT (continued)		Students perform equal to or better than other employees doing the same job who have not been trained in this program	Appendix D Question: 21 Appendix E Questions: 9, 10			
		What percentage of students graduate from the high school program?	Archival Records, Appendix D Questions: 1, 2, 26 Appendix G Questions: 6, 7	= or > 85% favorable response	1) Improve student support services 2) Improve selection process 3) Evaluate curriculum 4) Evaluate training methodology 5) Modify program	
		What percentage of students graduate from the community college program?	Archival Records Appendix D Question 26 Appendix G Questions: 6, 7			
		What percentage of students articulate from the high school program into the community college program?	Archival Records Appendix A Questions: 13, 14			

EVALUATION MATRIX TWO
PRODUCT EVALUATION

PROGRAM COMPONENTS	DECISION COMPONENTS					
	Program Goals	Operationalized Outcomes	Data Collection Format	Criteria	Judgement Alternatives	Decision
STUDENT (continued)	Quality	Provide program instructors with the ability and interest in training students	Appendix A Questions: 1, 2, 4 Appendix D Questions: 20(a), 20(b).	= or > 95% favorable response	1) In-service training 2) Industry training 3) Staff reassignment 4) Staff replacement	
		Provide graduates for employment that meet expectations of employers	Appendix D Question: 21. Appendix E Questions: 8, 9, 10, 11, 12. Appendix F Questions: 16, 17.		1) Evaluate curriculum 2) Evaluate instruction 3) Conduct industry needs assessment 4) Modify training program	
	Adequate Facilities	Provide adequate Automated Manufactoring Technology shop\laboratory facilities.	Appendix A Question: 7. Appendix D Questions: 20(h), 20(i). Appendix F Questions: 14.		1) Request for additional facilities/ lab space 2) Evaluate alternative training sites 3) Consider on site industry training 4) Modify program	

EVALUATION MATRIX TWO
PRODUCT EVALUATION

PROGRAM COMPONENTS	DECISION COMPONENTS					
	Program Goals	Operationalized Outcomes	Data Collection Format	Criteria	Judgement Alternatives	Decision
STUDENT (continued)	Adequate Tools, Equipment Supplies	Provide adequate tools, equipment, and supplies for vocational training	Appendix A Questions: 5, 8 Appendix D Questions: 20(f), 20(g) Appendix F Questions: 14, 15		1) Request additional tools/supplies 2) Request additional business/industry support 3) Modify program	
		Provide adequate supplies for instruction	Appendix A Questions: 6, 8 Appendix D Question: 20(f) Appendix F Questions: 14, 15			
	Equity	Enroll and graduate women students	Archival Records Appendix F Question: 5 Appendix G Questions: 2, 3	= or > percentage proportional to other non-traditional vocations in the local area	1) Increase public relations effort 2) Increase recruitment effort 3) Offer incentives for enrollment	
		Enroll and graduate minority group students	Archival Records Appendix F Question: 6 Appendix G Question: 5	= or > percentage of minority populations living in the local area		

SECTION VII: FINDINGS AND RECOMMENDATIONS

A. Process Evaluation

The first program component on the evaluation matrix is administration procedures. After extensive review of the project's archival records along with the evaluators' attendance and observation of events organized by the administrative staff, the administration procedures for this project were rated favorably. Appointment and active involvement of the project director, steering committee members, and advisory committee members was recorded and evidenced by their attendance and participation in the planned activities for this project.

The public relations effort of the administrative staff is to be commended. This effort was evidenced by the numerous news releases published in the local area newspapers, brochures, and local television coverage of 2 + 2 events. In addition, an attractive mobile display was designed and exhibited at various job fairs, vocational days, public schools, community colleges, and shopping malls to publicize the program.

The second program component of the process evaluation was curriculum development. After extensive review of the project's archival records to determine curriculum development strategies, needs assessment guidelines, and the validity and integration of the assessed needs into the developed curriculum document, the curriculum development component of the project was rated favorably. Project documents provided evidence of the development and utilization of

strategies (D.A.C.U.M., for example), business and industry involvement in the process, and needs assessment integration into the curriculum. A special note, every needs assessment task examined by the evaluators, be it secondary, community college, or both, was found to be integrated into the program's curriculum. The involvement, dedication, and completion of the curriculum is to be commended.

The final program component of the process evaluation is timeline integration. After extensive review of the project's archival records and review of the process stage end-product development, the timeline integration was found to be favorable. Realistic timelines were established and complied with during this phase of project development, as evidenced by the archival records and the end-products which were produced in a timely manner.

B. Product Evaluation

With the exception of the public relations brochure, the remaining product evaluation outcomes, such as curriculum effectiveness and student graduation rates, could not be evaluated at this time. This is due to the fact that the first student will not enter into the 2 + 2 training program until the Fall of 1991, and the first anticipated student graduate will be in the Spring 1994. However, the evaluation instruments have been developed and included in this evaluation guide to accomplish this task. An evaluation instrument guideline matrix is included (see Section IX) and contains suggested instruments and timeline to follow in

order to meet the goals of the product evaluation.

The second program component of the product evaluation matrix is audio-visual aids. For this component, the public relations brochure was evaluated. The Brochure Evaluation Form (see Appendix B) was used to gather the quantitative data in determining if the product met the criteria established (= or > 98% favorable response on all items). On September 8, 1990, a sampling of 34 persons, varying in ages (12 to 56 years old), and academic levels (middle school student to college graduates) was conducted outside of the University Shopping Mall in Blacksburg, Virginia. The data collected was analyzed using descriptive statistics and central tendency methodology. The data provided evidence that those surveyed either strongly agreed or agreed with all aspects of the brochure. The empirical data collected in this sample indicates that the public relations brochure meets or exceeds the established criteria for evaluation. Therefore, the program goal of developing a satisfactory public relations brochure was found to be favorable.

C. Recommendations

To date, the success of this project must be attributed to the comprehensiveness of involvement by business and industry leaders, school administrators from all levels, teachers from secondary schools and community colleges, state and local government officials, and the project director and staff. It is recommended that this effort be continued with the development of a project

evaluation team and a business/industry advisory council comprised of members of the before-mentioned groups. The success of an articulated training program of this complexity can only be achieved through the cooperation, coordination, and communication among all the involved participants.

It is recommended that the evaluation instruments and guidelines contained in this evaluation guide be utilized as formative and summative tools for data collection to ensure product quality and project success. The data collected from these tools can be used by the members of the project evaluation team, who collectively can make the hard decisions necessary to provide an efficient and effective training system.

APPENDIX A
STUDENT QUESTIONNAIRE

AUTOMATED MANUFACTURING TECHNOLOGY 2 + 2 PROGRAM
STUDENT QUESTIONNAIRE

Directions: Please circle the response that you deem appropriate for the statement posed.

RESPONSE KEY: E = Excellent G = Good F = Fair P = Poor
Please circle one response per question.

1. Individual attention you received from the teacher. E G F P
2. Teacher's preparation for class. E G F P
3. Your increase in knowledge and skill in Automated Manufacturing Technology. E G F P
4. Quality of training received. E G F P
5. Tools and equipment for student use. E G F P
6. Availability of up-to-date learning materials. E G F P
7. Condition of laboratory and\or work area. E G F P
8. Enough supplies (things that get used up, such as project materials, metals, welding rods). E G F P
9. Your satisfaction of this course. E G F P
10. Was Automated Manufacturing Technology your first choice in training programs? (check one) Yes____ No____
11. Do you want to get a job related to this program? (check one) Yes____ No____
12. Would you recommend this training program to a friend? (check one) Yes____ No____
13. Did you articulate from high school into the community college program? Yes____ No____

14. If you articulated into the community college does your high school course work compliment the program's community college curriculum? Yes___ No___N/A___

15. I first heard about the Automated Manufacturing Technology training program from:

_____ T.V. ad _____ Newspaper _____Guidance counselor _____Teacher

_____Other:_____

16. If you could improve this program what would you suggest? Please explain on the remainder of this sheet. Include any other comments you would like to make about this program that has not been covered by this questionnaire, thank you.

APPENDIX B
BROCHURE EVALUATION FORM

AUTOMATED MANUFACTURING TECHNOLOGY 2 + 2 PROGRAM
BROCHURE EVALUATION FORM

Directions: Please circle the response that you deem appropriate for the question posed.

RESPONSE KEY: SA = Strongly Agree A = Agree NS = Not Sure
D = Disagree SD = Strongly Disagree

Please circle one response per question.

1. The overall image is effective.	SA	A	NS	D	SD
2. The message is delivered.	SA	A	NS	D	SD
3. The content is concise.	SA	A	NS	D	SD
4. The brochure is grammatically correct.	SA	A	NS	D	SD
5. The brochure creates an air of professionalism.	SA	A	NS	D	SD
6. The brochure creates interest.	SA	A	NS	D	SD
7. The brochure is non-discriminatory.	SA	A	NS	D	SD
8. The colors are effective.	SA	A	NS	D	SD
9. The graphics were appropriate.	SA	A	NS	D	SD
10. The brochure prompts action.	SA	A	NS	D	SD

Comments:_____

APPENDIX C
VIDEO TAPE EVALUATION FORM

AUTOMATED MANUFACTURING TECHNOLOGY 2 + 2 PROGRAM
VIDEO TAPE EVALUATION FORM

Directions: Please circle the response that you deem appropriate for the question posed.

RESPONSE KEY: SA = Strongly Agree A = Agree NS = Not Sure
D = Disagree SD = Strongly Disagree

Please circle one response per question.

1. The message was clearly conveyed.	SA	A	NS	D	SD
2. The music was appropriate.	SA	A	NS	D	SD
3. The content was appropriate.	SA	A	NS	D	SD
4. The target audience will not be attracted by the content of this video.	SA	A	NS	D	SD
5. The timing of sequences is appropriate.	SA	A	NS	D	SD
6. The video creates interest.	SA	A	NS	D	SD
7. The video conveys pertinent information.	SA	A	NS	D	SD
8. The content theme was not expressed.	SA	A	NS	D	SD
9. The graphics were appropriate.	SA	A	NS	D	SD
10. The video presentation flowed smoothly.	SA	A	NS	D	SD

Comments:_____
_____
_____
_____
_____

APPENDIX D
STUDENT PLACEMENT AND FOLLOW-UP SURVEY FORM

AUTOMATED MANUFACTURING TECHNOLOGY 2 + 2 PROGRAM
STUDENT PLACEMENT AND FOLLOW-UP SURVEY FORM

Dear Automated Manufacturing Technology Program Graduate:

This survey is to assist your local vocational education program administrators in their planning process to support and fulfill the training needs of the students in the Roanoke Valley. Please help in this effort by completing the form below and returning it in the enclosed envelope; no stamp is necessary; and, your name and address are not required. All of the survey forms will be used together to help indicate the success of the Automated Manufacturing Technology program in providing quality vocational education to citizens of the community. Thank you.

1. Were you enrolled in the Automated Manufacturing Technology program at your high school?

_____ Yes
_____ No

2. Check the high school district in which you were enrolled?

_____ Roanoke County Schools
_____ Roanoke City Schools
_____ Botetourt County Schools
_____ Salem City Schools
_____ Craig County Schools
_____ Franklin County Schools
_____ Other:_____

3. Was the Automated Manufacturing Technology program your first choice when you decided to enroll in a vocational program?

----- Yes
_____ No

4. If the answer to question 2 was a "No" what was the major reason that influenced your decision?

_____ Program of choice was not offered.
_____ Program was full when I applied.
_____ Counselor advised against it.
_____ Parents advised against it.
_____ Teacher advised against it.
_____ Other:_____

5. If you could start your training all over again now, what program would you choose?

_____ Same program
_____ Different vocational program Which one? _____
_____ Non-vocational education program

6. What is your present status? (check all that apply)

_____ In school full time
_____ In school part time
_____ Employed full time
_____ Employed part time
_____ Unemployed; seeking employment
_____ Unemployed; not seeking employment
_____ Other:_____

If you checked employed full or part time; omit questions 6-18.

7. If employed give the following information:

Present job title:_____
Hours worked per week:
_____ less than 30 hours _____ 30 hours or more

8. How do you like your present job?

_____ Very much
_____ Like it somewhat
_____ Dislike it somewhat
_____ Dislike it very much

9. Did you get the job because of your vocational training in school?

_____ Yes
_____ No

10. How often do you use the vocational training on the job?

_____ Frequently
_____ Occasionally
_____ Never

11. What are your present job duties?

_____

_____

12. What is the pay per week before deductions on your present job?

_____ $120.00 or less
_____ $121.00 - $150.00
_____ $151.00 - $180.00
_____ $181.00 - $210.00
_____ $211.00 - $240.00
_____ $241.00 or more

13. How many full time jobs have you had since leaving school?

_____ none
_____ one
_____ two
_____ three
_____ four or more

14. What was the title of your first full time job after leaving high school?

_____

15. If you first full time job was not related to the Automated Manufacturing Technology field, please explain why not.

_____

_____

16. Where was the location of your first job after graduation?

_____ Within your high school district
_____ Within the county in which you lived while in high school
_____ Within the state in which you lived while in high school
_____ Out of state Specify:_____

17. Who helped you find your first full time job after training?

_____ Your vocational teacher
_____ Guidance counselor
_____ School placement service
_____ State employment service
_____ Relatives
_____ Found it yourself
_____ Other:_____

18. If it took longer than you expected to find your first job, what was the reason?

_____

19. How well did your vocational training prepare you for your first job?

_____ Exceptionally well
_____ Well
_____ Not very well
_____ Poorly

20. Please rate your former school and the Automated Manufacturing Technology training program on each of the following items:

RESPONSES: E = Excellent G = Good F = Fair P = Poor
(circle one response per item)

a) Instructor's ability to teach.	E	G	F	P
b) Instructor's interest in students.	E	G	F	P
c) Quality of training.	E	G	F	P
d) Guidance counseling service.	E	G	F	P
e) Career information available.	E	G	F	P
f) Supplies for learning activities.	E	G	F	P
g) Tools and equipment.	E	G	F	P
h) Condition of labs\shops.	E	G	F	P
i) Condition of school building.	E	G	F	P

21. Do you think your employer is satisfied that your work is better than that performed by other employees on the same job who have not have Automated Manufacturing Technology training?

_____ Yes
_____ No

22. What learning experiences do you feel need to be added to the Automated Manufacturing Technology training program?

_____
_____
_____

23. What areas, if any, were overemphasized in the Automated Manufacturing Technology training program?

_____
_____
_____

24. Did you articulate into the Virginia Western Community College's Automated Manufacturing Technology program?

_____ Yes
_____ No

25. If you answered yes to question 24, did you experience any difficulties with the transition into the community college program?

_____ No
_____ Yes Explain:_____

26. What is the highest educational level you have obtain to date?

_____ Graduate - High school - no college hours
_____ Graduate - High school - less than one year of college
_____ Graduate - High school - one year of college
_____ More that one year of college but less than two years
_____ Two years of college - no degree
_____ Graduate - Associate degree (Automated Manufacturing Program)
_____ Associate's degree plus 30 college hours
_____ Graduate 4-year college or university
_____ Other: _____

APPENDIX E
EMPLOYER SURVEY FORM

AUTOMATED MANUFACTURING TECHNOLOGY 2 + 2 PROGRAM
EMPLOYER SURVEY FORM

Dear employer:

Our records indicate that _____ is employed by your company. Your cooperation in completing the following survey will be appreciated and will assist in the evaluation and improvement of our vocational program.

Please answer each of the following questions and return the questionnaire in the enclosed envelope.

1. _____ is currently employed by your company.
(Name of Graduate)

2. This person's job title is _____.

3. Employment begin on _____ date.

4. Automated Manufacturing Technology preparation training was a factor in deciding to employ this person.

_____ Yes
_____ No

5. This company employs persons who have had no vocational training in the same job.

_____ Yes
_____ No

6. This employee is employed:

_____ less than 30 hours per week.
_____ 30 hours or more per week.

7. What is the pay per week before deductions for this employee?

_____ $120.00 or less
_____ $121.00 - $150.00
_____ $151.00 - $180.00
_____ $181.00 - $210.00
_____ $211.00 - $240.00
_____ $241.00 or more

8. How well did the Automated Manufacturing Technology program prepare this employee for job performance?

_____ Exceptionally well
_____ Well
_____ Not very well
_____ Poorly

9. Is the work performed by this employee equal to or better than that performed by other workers doing the same job but who have not had vocational training?

_____ Yes
_____ No

10. If the answer to question 9 is "No," describe the major differences.

_____
_____
_____

11. If the answer to question 9 is "Yes," do you consider the employee to be well trained and prepared for employment?

_____ Yes
_____ No

12. If the answer to question 11 is "No," describe the major deficiencies observed in the worker's performance.

_____
_____
_____

13. Do you anticipate terminating this employee in the future?

_____ Yes
_____ No

14. If the answer to question 13 is "Yes," please specify reason(s).

_____
_____
_____

15. Would you employ other graduates of the same vocational program?

_____ Yes
_____ No

16. Do you currently have openings for new employees in this occupation?

_____ Yes If "Yes," how many (approximately) _____
_____ No

17. Have you ever been contacted by a school representative concerning the placement of graduates?

_____ Yes How many times _____
_____ No

18. Does your company participate in the cooperative vocational training program?

_____ Yes
_____ No

19. Does your company have a representative who participates as a member of the local Automated Manufacturing Technology advisory committee?

_____ Yes
_____ No

20. If the answer to question 19 is "No," and your company would like to participate, please give the name and phone number of a contact person.

_____

21. Does your company participate in the vocational educational program by providing tours and guest speakers?

_____ Yes
_____ No

22. If the answer to question 21 is "No," would you participate if contacted?

_____ Yes Contact person:_____
_____ No

APPENDIX F
TEACHER QUESTIONNAIRE

AUTOMATED MANUFACTURING TECHNOLOGY 2 + 2 PROGRAM
TEACHER QUESTIONNAIRE

Consider the Automated Manufacturing Technology program in your school. Rate the degree of success your school has had in the following areas. Circle the response that best describes your opinion.

E = Excellent G = Good F = Fair P = Poor

1. Providing orientation and exploration experiences to help students make career decisions. E G F P
2. Guiding students into programs appropriate to their needs and abilities. E G F P
3. Providing placement services for vocational students. E G F P
4. Conducting local follow-up of vocational graduates. E G F P
5. Changing attitudes toward non-traditional courses for boys and girls. E G F P
6. Attracting proportionate numbers of minority students for this program. E G F P
7. Providing competency-based instruction for this program. E G F P
8. Having business and industry representatives visit classes in the school. E G F P
9. Working with advisory committee or craft committees. E G F P
10. Having active vocational student organizations. E G F P
11. Having communication among vocational teachers about what goes on in this program. E G F P
12. Achieving a positive image for this program. E G F P

13. Receiving support from the administration. E G F P

14. Having adequate facilities and equipment to support this program. E G F P

15. Having adequate consumable supplies. E G F P

16. Producing graduates with knowledge needed for jobs in the Automated Manufacturing industry. E G F P

17. Producing graduates with skills needed for jobs in the Automated Manufacturing industry. E G F P

18. How would you rate the curriculum for the Automated Manufacturing Technology program. E G F P

19. Are there any components of the curriculum that need to be changed?

_____ Yes
_____ No

20. If you answered question 19 with a "Yes," please explain.

_____

_____

_____

_____

_____

21. Are there any other comments you would like to make about the Automated Manufacturing Technology program in your school?

_____

_____

_____

_____

APPENDIX G
STUDENT GRADUATION FORM

AUTOMATED MANUFACTURING TECHNOLOGY 2 + 2 PROGRAM
STUDENT GRADUATION FORM

NAME: _____

ADDRESS: _____

_____

PHONE: _____

1. AGE: _____ 2. MALE: ____ 3. FEMALE: ____

4. SOCIAL SECURITY NUMBER: _____

5. RACE:

____ AMERICAN INDIAN
____ ASIAN
____ BLACK
____ HISPANIC
____ WHITE

6. LEVEL AT WHICH AUTOMATED MANUFACTURING TECHNOLOGY TRAINING COMPLETED:

____ HIGH SCHOOL
SPECIFY WHICH ONE: _____

____ COMMUNITY COLLEGE
SPECIFY WHICH ONE: _____

7. DATE OF PROGRAM COMPLETION: _____

8. HAVE YOU FOUND EMPLOYMENT?

____ NO
____ YES

9. IF YOU ANSWERED QUESTION 8 WITH A "YES," PLEASE GIVE THE EMPLOYER'S NAME: _____

EVALUATION GUIDELINE MATRIX

EVALUATION GUIDELINE MATRIX

Evaluation Instruments and Initial Utilization Timeframes to Achieve Established Goals

PROGRAM COMPONENTS	Appendix A	Appendix B	Appendix C	Appendix D	Appendix E	Appendix F	Appendix G
Goals:							
CURRICULUM DEVELOPMENT							
Internal Validity				Spring/Fall 1994	Spring/Fall 1994	Spring/Fall 1994	Spring/Fall 1994
External Validity	Summer/Fall 1994			Summer/Fall 1994			
Improve Program	Fall 1991			Fall 1991		Fall 1991	

EVALUATION GUIDELINE MATRIX

PROGRAM COMPONENTS	Evaluation Instruments and Initial Utilization Timeframes To Achieve Established Goals						
	Appendix A	Appendix B	Appendix C	Appendix D	Appendix E	Appendix F	Appendix G
Goals:							
AUDIO-VISUAL AIDS							
Brochure	As Needed						
Video Tape Recruitment			Spring/Summer 1991				
Video Tape Pre-Enrollment			Spring/Summer 1991				

EVALUATION GUIDELINE MATRIX

PROGRAM COMPONENTS	Evaluation Instruments and Initial Utilization Timeframes To Achieve Established Goals						
	Appendix A	Appendix B	Appendix C	Appendix D	Appendix E	Appendix F	Appendix G
Goals:							
STUDENT							
Satisfaction	After first grading period			Spring/Summer 1994			Summer/Fall 1994
Placement				Summer/Fall 1994	Summer/Fall 1994		
Guidance Services				Summer/Fall 1994		Summer/Fall 1994	Summer/Fall 1994
Effectiveness	Fall 1994			Summer/Fall 1994	Summer/Fall 1994		Spring 1994
Quality	Fall 1991			Fall 1994	Spring/Fall 1994	Fall 1991	

EVALUATION GUIDELINE MATRIX

PROGRAM COMPONENTS	Evaluation Instruments and Initial Utilization Timeframes To Achieve Established Goals						
	Appendix A	Appendix B	Appendix C	Appendix D	Appendix E	Appendix F	Appendix G
Goals:							
STUDENT (continued)							
Adequate Facilities	Fall 1991			Fall 1994		Fall 1991	
Adequate Tools, Equipment, and Supplies	Fall 1991			Fall 1994		Fall 1991	
Equity						Fall 1991	Spring 1994

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THANK YOU

We appreciate your efforts in

making...

A+ FOR THE VALLEY